40

TRANSCRIPT OF RECORD.

SUPREME COURT OF THE UNITED STATES.

OCTOBER TERM, 1[redacted] 1920

No. [redacted]93

BERLIN MILLS COMPANY, PETITIONER,

vs.

PROCTOR & GAMBLE COMPANY.

ON WRIT OF CERTIORARI TO THE UNITED STATES CIRCUIT COURT OF APPEALS FOR THE SECOND CIRCUIT.

PETITION FOR CERTIORARI FILED APRIL 8, 1919.

CERTIORARI AND RETURN FILED MAY 7, 1919.

(27,060)

(27,050)

SUPREME COURT OF THE UNITED STATES.

OCTOBER TERM, 1919.

No. 344.

BERLIN MILLS COMPANY, PETITIONER,

vs.

PROCTOR & GAMBLE COMPANY.

ON WRIT OF CERTIORARI TO THE UNITED STATES CIRCUIT COURT OF APPEALS FOR THE SECOND CIRCUIT.

INDEX.

	Original.	Print.
Caption	*a*	1
Transcript of record from the district court of the United States for the southern district of New York	1	1
Order as to time for taking depositions, &c	1	1
Notice as to taking testimony	2	2
Testimony of John J. Burchenal	3	2
Stipulation as to exhibits	128	80
Testimony of Wallace Eugene McCaw	129	80
Testimony of Albert Edward Anderson	160	99
Clerk's certificate to depositions	202	127
Stipulation as to depositions	205	129
Kayser correspondence	207	129
Testimony of William Cooper Proctor	210	131
Deposition of John J. Burchenal	227	142
Albert Edward Anderson	268	167
Wallace Eugene McCaw	284	177
Testimony of John J. Burchenal (recalled)	308	191
Letter, McCaw to Burchenal, May 6, 1908	308	191
Letter, McCaw to Burchenal, May 27, 1908	309	191

JUDD & DETWEILER (INC.), PRINTERS, WASHINGTON, D. C., OCTOBER 2, 1919.

	Original.	Print
Letter, McCaw to Burchenal, August 17, 1908	310	193
Letter, Burchenal to McCaw, August 28, 1908	311	193
Letter, McCaw to Burchenal, August 28, 1908	311	193
Letter, McCaw to Burchenal, September 3, 1908	312	193
Deposition of Harley J. Morrison	313	194
Deposition of James N. McCaw	353	218
Clerk's certificate to depositions	363	224
Stipulation for appointment of Alice M. Rankin special examiner	365	225
Deposition of Clarence von Phul	369	226
Deposition of Kathryn J. von Phul	403	248
Statement by examiner	407	251
Examiner's certificate	408	251
Bill of complaint	411	252
Answer	414	254
Amendment to answer	422	259
Interrogatories (defendant's) and answers	425	269
Stipulation as to evidence	428	262
Testimony of Charles Baskerville	431	264
Guy B. Taylor	448	275
Harley J. Morrison	459	281
Offers of evidence by defendant	463	284
Testimony of William H. Walker	466	286
Walker Chart No. 1	470½	288
No. 2	474½	290
No. 3	476½	292
No. 4	478½	294
No. 5	479	294
No. 6	482½	297
No. 8	486*a*	300
No. 7	486*b*	300
No. 9	488*a*	302
No. 11	492*a*	305
No. 12	494*a*	307
Photographs, &c	500*a*	311
Photographs, &c	502*a*	312
Photographs, &c	504*a*	314
Photographs, &c	506*b*	316
Walker Chart No. 13	510	319
Testimony of William D. Richardson	551	344
Testimony of George A. Richter	571	357
Diagram	574*a*	359
Diagram	608½	380
Testimony of Frank E. Barrows	638	399
Raymond F. Bacon	644	403
Charles Baskerville	728	452
Chart	728*a*	453
Chart	728*b*	453
Chart	730*a*	455
Chart	134*a*	458

	Original.	Print.
Chart	73[illegible]	469
Chart	7[illegible]a	460
Walker Chart No. 18	7[illegible]8a	474
Testimony of Harley J. Morrison	779	488
Testimony of Emma Hanko	792	496
Burchenal patent No. 1,135,351	803	503
Complainant's Exhibit 2—Stipulation of March 17, 1917, and exhibits referred to therein	805	504
"Kream Krisp" pamphlet	806	505
Plaintiff's Exhibit Defendant's Pamphlet B	806a	509
"Kream Krisp" pamphlet	807	511
Plaintiff's Exhibit 14—Paal patent No. [illegible]88, 1911 (British)	808	525
Plaintiff's Exhibit No. 15—Bedford & Williams patent No. 9112 of 1908 (British), &c.	812	529
Complete specification	812	529
Patents—Bloom, No. 782,820	848	565
Schwoerer, No. 902,177	851	568
Kayser, No. 1,004,035	854	571
Kayser, No. 1,008,474	858	575
Ellis, No. 1,038,545	862	579
Burchenal, No. 1,135,935	865	582
Translation of German patent No. 141,029, August 14, 1902	874	591
Article in Zeitschrift für Elektrochemie, published at Halle, Germany, volume 12 (year 1906), pages 749 to 762, inclusive, translation	876	592
Articles by Fokin in the journal of the Russian Physical-Chemical Society, volume 38, year 1906, pages 419-446, inclusive; volume 38, year 1906, pages 855-858, inclusive; volume 39, year 1907, pages 607-609, inclusive; volume 40, year 1908, pages 304-321, inclusive, translation	881	595
Article by Fokin in "Zeitschrift für Angewandte Chemie und Centralblatt für technische Chemie," volume 22, year 1908, pages 1496 to 1502, inclusive, translation	885	597
Articles by Paal and Roth in "Berichte der Deutschen Chemischen Gesellschaft," volume 41, July 11, 1908, pages 2282 to 2291, inclusive, and volume 42, May 8, 1909, pages 1541 to 1553, inclusive, translation	[illegible]9	599
Defendant's Exhibit G—File-wrapper and contents of Kayser patent No. 1,004,035	921	617
Defendant's Exhibit H—File-wrapper and contents of Kayser patent No. 1,008,474	953	649
Moore patent No. 1,121,869, December 22, 1914	985	681
Moore patent No. 1,184,486, May 23, 1916	996	692
Photograph of the spray nozzle in the capsule with manhole open	1007	702
Defendant's Exhibit Y—Drawing of Fort Worth apparatus.	1007a	702
Photographs	1008	702
Defendant's Exhibit VI—Correspondence between plaintiff and defendant	1014	703

	Original.	Print.
Sears patent 10,783, 1887 (British)	1026	709
McFarland patent 884,606, April 14, 1908	1028	712
Defendant's Exhibit N2—Article by Sabatier and Senderens, 1905, publication including translation	1030	713
Defendant's Exhibit O2—Inaugural dissertation of F. Bedford, published from the University of Halle, Germany, in 1906, including translation of Part II thereof	1041	719
Defendant's Exhibit P2—Bulletin No. 469 of the United States Department of Agriculture, entitled "Fats and their economical use in the home"	1062	731
Opinion, A. N. Hand, D. J	1090	750
Final decree	1104	766
Petition on appeal	1105	766
Allowance of appeal	1105	767
Assignment of errors	1106	767
Citation and service	1108	768
Bond on appeal	1110	769
Præcipe for record	1113	770
Order waiving equity rule 75	1115	771
Stipulation as to record	1116	772
Clerk's certificate	1117	772
Opinion, Hough, C. J	1118	773
Opinion, Ward, J., dissenting	1128	779
Petition for rehearing	1130	780
Opinion, Hough, C. J., on petition for rehearing	1163	802
Decree	1165	803
Order denying petition for rehearing	1167	804
Clerk's certificate	1168	804
Writ of certiorari and return	1169	805

a Original.

TRANSCRIPT OF RECORD.

United States Circuit Court of Appeals for the Second Circuit.

PROCTER & GAMBLE COMPANY, Complainant-Appellant,

vs.

BERLIN MILLS COMPANY, Defendant-Appellee.

Appeal from the District Court of the United States for the Southern District of New York.

1 *Order.*

United States District Court, Southern District of New York.

In Equity. # 13—100.

On Burchenal Patent # 1,135,351.

PROCTER & GAMBLE COMPANY, Plaintiff,

vs.

BERLIN MILLS COMPANY, Defendant.

On motion of John C. Pennie, Esq., solicitor for the defendant herein,

It is ordered, that the defendant may take the depositions of John J. Burchenal, William Cooper Procter, and Wallace E. McCaw, of Cincinnati, Ohio, and Edward A. Anderson, of Ivorydale, Ohio, before B. E. Dilley, Clerk of the United States District Court for the Southern District of Ohio, or before a Notary Public of the State of Ohio, acting as a special examiner, after giving reasonable notice of the taking of such depositions to the solicitors for the plaintiff herein, and that such depositions may be used before the Court at the final hearing of this cause.

New York, N. Y., September 23, 1916.

MARTIN T. MANTON,
United States District Judge.

2 *Notice of Taking Testimony.*

United States District Court, Southern District of New York.

In Equity. #13—100.

On Burchenal Patent #1,135,351.

PROCTER & GAMBLE COMPANY, Plaintiff,

vs.

BERLIN MILLS COMPANY, Defendant.

Messrs. Kerr, Page, Cooper & Hayward, Solicitors for Plaintiff, 55 Liberty Street, City.

SIRS:

Please take notice that on Wednesday, September 27, 1916, before B. E. Dilley, Esq., or other duly qualified officer at eleven o'clock A. M. Room No. 317, Government Building, Cincinnati, Ohio, I shall proceed to take the testimony de bene esse of John J. Burchenal, William Cooper Procter, and Wallace E. McCaw, of Cincinnati, Ohio, and Edward A. Anderson, of Ivorydale, Ohio, under and in accordance with Section No. 863, et seq., of the Revised Statutes. The taking of testimony will be adjourned from day to day until completed. You are invited to attend and cross examine.

New York, N. Y., September 23, 1916.

JOHN C. PENNIE,
Solicitor for Defendant.

Service of a copy of the foregoing notice acknowledged this 23rd day of September, 1916.

KERR, PAGE, COOPER & HAYWARD,
Solicitors for Plaintiff.

3 In the District Court of the United States, Southern District of New York.

In Equity. #13—100.

On Burchenal Patent #1,135,351.

PROCTER & GAMBLE COMPANY, Plaintiff,

vs.

BERLIN MILLS COMPANY, Defendant.

Depositions taken de bene esse on behalf of the defendant, pursuant to Section 863, Revised Statutes, pursuant to the order of the Court dated September 23, 1916, and to the annexed notice.

Before Boyd E. Dilley, Clerk of the United States District Court for the Southern District of Ohio, acting as Special Examiner, beginning at ten o'clock Wednesday morning, October 4, 1916, Room No. 317, Federal Building, Cincinnati, by consent of counsel the taking of testimony being postponed from Wednesday, September 27, 1916.

Alfred M. Allen, Esq., appearing in behalf of the plaintiff.

Messrs. F. E. Barrows and Marcus B. May appearing in behalf of the defendant.

JOHN J. BURCHENAL, a witness produced in behalf of the defendant, having been first duly sworn, deposes and says as follows in answer to oral interrogatories:

By Mr. May:

Q. Please state your name, age, residence and occupation?

A. John J. Burchenal; age, fifty-five; residence, Glendale,
4 Ohio; occupation, Vice-President and General Manager of the Procter & Gamble Company.

Q. 2. Have you any other occupation save that incident to your employment by the Procter & Gamble Company?

A. Well, a good many occupations, but nothing I consider relates—Isn't that sufficient? I could go ahead here and state for some time the things I am occupied in, but of course it seems to me all that would be irrelevant.

Q. 3. Are you an officer of the Hydrogenation Comapny?

A. Yes; I am president of it.

Q. 4. How long have you been associated with Procter & Gamble Company?

A. Over thirty years.

Q. 5. How long have you been General Manager?

A. I don't remember—eight or ten years—I can easily find out about eight years, I should say.

Q. 6. Do your duties lead you to know of the work that is carried on in the Procter & Gamble Company factory?

A. Yes.

Q. 7. And that has been so for a number of years?

A. Thirty years.

Q. 8. Were you acquainted with Edwin Cuno Kayser?

A. Yes; I knew him.

Q. This Edwin Cuno Kayser is the patentee of Letters-Patent Numbers 1,001,279, dated August 22, 1911; 1,004,034, dated September 26, 1911; 1,004,035, dated September 26 1911, and 1,008,474, dated November 14, 1911, is he not?

A. Those are the numbers of the Letters-Patent?

Mr. Allen: I think so.

Q. 10. You can look and see, if you desire? (Exhibiting papers.)

A. Well, those are our patents—that is the same man.

5 Mr. Allen: Counsel for Procter & Gamble Company objects to so much of the inquiry as relates to the Kayser patent No. 1,004,034. I want to object in reference to Nos. 1,001,279 and 1,004,434, as irrelevant and immaterial.

Q. 11. When did you first become acquainted with Mr. Kayser?

A. I became acquainted with Mr. Kayser in the fall of 1907.

Q. 12. Can you not fix the date more closely?

A. Well, it was in October or November; I cannot fix the exact date.

Q. 13. What were the circumstances under which you became acquainted with Mr. Kayser?

A. Mr. Kayser wrote to us from a place called, Lymn, Cheshire, England, to advise us he had a process of considerable value and would like to talk to us about it. He stated he was coming to this country. I can't give you the exact correspondence on this thing; I haven't seen it for years, but that was the starting-point. He appeared in our office one day in October or November, 1907. I can probably come pretty near locating that date, if it is in the correspondence.

Q. 14. Have you the original correspondence between Mr. Kayser and the Procter & Gamble Company?

A. I presume we have; I haven't seen it, but it must be around there some place.

Q. 15. Will you produce it?

Mr. Allen: The production of the correspondence is objected to as irrelevant and immaterial.

A. I suppose we could produce it, if you place any importance upon it. It has been nine years since then.

6 Q. 16. My question is, will you produce it?

A. I don't know that we can produce it; we would be very glad to try; I don't know where it is. Do you think it is important? It might take days. Would you be willing to pay the expense of the search?

Q. 17. I am asking you if you will make a search and produce the original correspondence?

A. I say, will you be willing to defray the expense of the search? search?

Mr. Allen: Counsel for Procter & Gamble Company, objects to the production of the correspondence on the ground it is irrelevant and immaterial, and instructs the witness he need not produce it unless he wishes.

Q. 18. Will you make a search for this original correspondence between Mr. Kayser and the Procter & Gamble Company, which took place before Mr. Kayser called on the Procter & Gamble Company, and produce it?

Mr. Allen: The same objection and the same instruction to the witness.

Q. I don't see any reason why we should make an effort in the thing, unless it is of sufficient value to the defendants in this case to stand the expense of the search. Our records are kept in our office for probably two or three years; then they are sent out to our factory and maintained there for several years. I don't know that we have records of that kind going back nine years. Now, if we could go and place our hands upon it, that would be a very simple thing; but if we can't we might search there for days or weeks and not find it; I don't know how far you would want to go in the thing.

Q. 19. The answer is objected to as irrelevant, and the question is repeated to the witness?

A. We will make a search, yes; I can't promise to produce it, though, because I don't know that we can find it.

Q. 20. If you find it, will you produce it?

Mr. Allen: You will be guided by counsel?

A. Yes; we will be guided by counsel.

Q. 21. Will you have the search undertaken at once?

A. Are the defendants willing to defray the expense of the search?

Q. 22. The defendant is willing to pay a reasonable expense incident to the search?

A. Well, you will have to pay whatever the expense will be; whatever it may be, you will have to defray it.

Q. 23. What was the tenor of Mr. Kayser's letters, if you remember?

A. As I recall it, his communication was very vague and indefinite, simply held out the hope of something of considerable value, without stating exactly what it was.

Q. 24. Don't you remember what he said?

A. No.

Q. 25. When is the last time you saw that letter of Mr. Kayser's?

A. I have certainly never seen it since 1907.

Q. 26. Mr. Kayser then came to the United States?

A. Yes.

Q. 27. In the Fall, that is, in October or November of 1907?

A. Yes.

Q. 28. And you had a confernece with him then?

A. Yes; many.

Q. 29. Did Mr. Kayser, at these conferences with you in the Fall of 1907, state what his project was, or what he had in mind to accomplish?

A. Well, he did not have any special project; he had a process that he wanted to sell to the Procter & Gamble Company.

Q. 30. What was the process that he wished to sell?

A. The process was a process of hardening fats by hydrogenization

Q. 31. Did he explain his process to you?

A. Well, there was a good deal of mystery about Mr. Kayser. He did not explain anything to us until he had drawn us some sort

of preliminary contract which was based on his claim of what he could do.

Q. 32. What was the date of that preliminary contract?

A. I don't recall it, but I think it was some time in January, 1908.

Q. 33. At that time he explained to you what his process was?

A. After that was finished, yes, he explained it.

Q. 34. What did he say at that time his process consisted in?

A. Well, it was in a general way a hardening of fats by the saturation of the liquid with hydrogen in the presence of a nickel catalyst.

Q. 35. Did he tell you how he proceeded to carry this process out?

A. Oh, yes; he went into considerable detail.

Q. 36. Will you please state in detail what Mr. Kayser said as to his process and how he intended to carry it out?

A. Well, I don't know that I can recall that detail. Of course I know the process, but I don't recall the detail. It was very close to what we did afterward, though of course in his more detailed instructions leading to the construction of the apparatus and
9 the establishment of experimental plants, that was done more largely at our factory, than it was done with me.

Q. 37. When Mr. Kayser first came to see you in October or November of 1907, did he bring any samples of those hardened fats?

A. Yes.

Q. 38. Did you see them?

A. Yes.

Q. 39. Did you have them analyzed?

A. I don't recall.

Q. 40. What was the appearance of those samples?

A. Well, the appearance was, they were hard, almost white in appearance—hard material.

Q. 41. Did Mr. Kayser tell you of what they were made?

A. Yes.

Q. 42. Of what were those samples made?

A. As I recall it, he had several samples. My impression is that he had samples there from Cotton Seed oil and, as he called it, "maize" oil. I am not sure about that; I remember the Cotton Seed oil and I think he had the other, too, he had several samples.

Q. 43. Did you ascertain the melting point of any of these samples?

A. I don't recall that I did; they were very hard, though.

Q. 44. Did anybody, so far as you known ascertain the melting point of the samples?

A. No; I don't recall that they did.

Q. 45. Did you ascertain the Iodin value of those hardened fats?

A. Not that I recall.

Q. 45. Did anyone, so far as you know?

A. Not that I recall.

Q. 46. What is the "Iodin value" of an oil or fat?

Mr. Allen: The question is objected to as irrelevant and immaterial and the witness is instructed that he need not go into this.

10 Q. 47. Do you understand what is meant by "Iodin" value?

A. In a general way.

Q. 48. What do you understand to be meant by "Iodin" value?

Mr. Allen: The same objection is made and the witness is instructed that he need not answer this question or go into the matter of chemistry, or Iodin value.

Q. 49. Did you ascertain the saponification value of any of those samples?

Mr. Allen: The same objection.

A. I don't recall that we did.

Q. 50. What became of those samples?

A. I don't know.

Q. 51. Who, beside yourself, saw those samples of Mr. Kayser's? I am referring now to employees of the Procter & Gamble Company?

A. I don't remember whether anyone did.

Q. 52. Do you remember whether Mr. Procter did?

A. I am rather inclined to think that he did, though I do not recall that he did. It was an experimental thing; very likely I showed them to him, but I don't recall it.

Q. 53. What was their color?

A. They were very light in color, pale yellow or almost white.

Q. 54. And Mr. Kayser told you that at least one of those samples had been made by hydrogenating cotton seed oil in the presence of a catalyst?

A. Yes.

Q. 55. Did he tell you where those samples had been produced?

A. No.

Q. 56. Did you know where they had been produced?

A. No.

11 Q. 57. Did you know whether or not they had been made in this country?

A. I was very well satisfied they had not been made in this country; in fact from his conversation I had no reason to doubt that they had been made in England, because he had not been in this country two days until he came to our plant, came to our office.

Q. 58. When he came to your office after arriving in this country, did you start negotiations with him then?

A. Yes; he started negotiations with us then.

Q. 59. And these negotiations were continued from time to time until January, 1908, at which time you made a preliminary contract with Mr. Kayser?

A. That is right—I say, about January.

Q. 60. Yes?

A. I can look that thing up, but I don't recall the exact date.

Q. 61. During this interim, did Mr. Kayser make any attempt to practice his process at the Proctor & Gamble Company?

A. Mr. Kayser went out to our factory and made sketches as to the apparatus that would be necessary to carry on this work and the apparatus was ordered at once; a little plant was installed for experimental purposes and I think it was ready to operate sometime in January or February, 1908.

Q. 62. And it was? The plant was started in operation in January or February of 1908?

A. The experimental plant, yes.

Q. 63. What was the apparatus that Mr. Kayser used in this plant?

Mr. Allen: The question is objected to as irrelevant and immaterial and the witness is instructed he need not go into that matter.

12 A. I can't tell you all the things they had there; he had an outfit there.

Mr. May: Counsel for defendant objects to counsel for plaintiff assuming the function of the Court in instructing the witness not to answer this and preceding questions, and gives notice that he will in due course move the Court to instruct the witness to answer the questions.

Mr. Allen: Counsel for plaintiff states that he makes the objections because the patent in suit is a food product patent and because the line of interrogatories propounded by the defendant was passed upon by the Court for relevancy and such interrogatories were decided to be irrelevant and immaterial; therefore counsel for plaintiff does not feel that the witness should be called as a witness for the defendant and interrogatories put to him of the same nature as those which have already been stricken out by the Court.

Mr. May: Counsel for the defendant states on the record that one of the defenses of the defendant is, prior knowledge and use of the product of the patent in suit by Kayser and others, with the knowledge of the plaintiff, and he is pursuing this line of inquiry for the purpose of eliciting the facts.

Q. 64. (Question read.)

A. It is very difficult for me to recall the apparatus used there.

Q. 65. Will you look at figure one of the drawing of the Kayser patent, number 1,004,035 and state whether a part of the apparatus, at least, is similar to that apparatus?

13 Mr. Allen: The same objection and the same instruction to the witness.

A. Am I instructed not to answer the question?

Mr. Allen: Yes.

Q. 66. Was this apparatus used for the hydrogenizing of oils at that time in January or February, 1908?

Mr. Allen: You may decline to answer, if you wish.

A. Upon advice of counsel I decline to answer.

Mr. May: The same notice as previously given.

Q. 67. Was cottonseed oil hydrogenized in this apparatus by Mr. Kayser?

Counsel for the plaintiff interposes the same objection and instructs the witness as before noted. The witness declines to answer and counsel for the defendant gives the same notice as before.

Q. 68. Do you know whether or not any oils were hydrogenized by Mr. Kayser with that apparatus in January or February of 1908?

Counsel for the plaintiff interposes the same objection and instructs the witness as before noted. The witness declines to answer and counsel for the defendant gives the same notice as before.

14 Q. 69. You refuse to answer the preceding questions?

A. On advice of counsel, I do.

Q. 70. Did Mr. Kayser, in point of fact, hydrogenize any oil at the Proctor and Gamble Company in January or February of 1908?

A. Yes.

Q. 71. What oils were hydrogenized?

A. The work was carried on in an experimental way. I cannot tell you exactly what oils. Most of the work was done with cottonseed oil.

Q. 72. And the cottonseed oil was hydrogenized by Mr. Kayser?

A. Yes.

Q. 73. By the addition of hydrogen in the presence of a nickel catalyst?

A. Yes.

Q. 74. Did you see this process carried on yourself?

A. Yes.

Q. 75. Was the oil heated?

A. Yes.

Q. 76. During the hydrogenization? To what temperature was it heated, if you know?

Mr. Allen: The question is objected to as irrelevant and immaterial and the witness is instructed that he need not answer.

A. I don't know.

Q. 77. Will you please state how the process was carried on? Was the oil under pressure, as well as heated?

Counsel for the plaintiff interposes the same objection and instructs the witness as before noted. The witness declines to answer and counsel for the defendant gives the same notice as before.

Q. 78. Did you see the product which was produced by that process?

A. Yes, many times.

Q. 79. What process was carried on there from day to day, I assume?

A. From time to time.

Q. 80. And you saw that operation?

A. From time to time.

Q. 81. Many times did you make any analysis of the product?

A. I?

Q. 82. You, or anyone else in your employ, in the Procter & Gamble Company.

A. I think so. I did not.

Q. 83. Who did, that you know?

A. I don't recall; possibly Mr. Kayser.

Q. 84. Did anyone else beside Mr. Kayser make any analysis of any of the product?

A. I don't recall. I don't think so.

Q. 85. Were any reports made to you, or to the officers of the Procter & Gamble Company by Mr. Kayser, from time to time?

A. Yes.

Q. 86. They were written reports?

A. Some were written, some were oral.

Q. 87. Did he furnish you, or other officials of the company, with analyses of his product?

A. Well, I don't know as to his analyses. There were certain tests made to indicate the character of the material. We saw the tests.

Q. 88. What were the tests?

A. The tests were principally for the melting point. Of course, we were trying to harden the material.

Q. 89. And tests were made to determine the melting point of the material produced by hydrogenization?

A. Generally.

Q. 90. Did you ascertain titre?

A. I would think the titre or melting point would be one indication of the other; we would regard them as collateral tests.

Q. 91. That is, you assume that with a given melting point, the titre would have a certain correlation?

A. Yes, which it does.

Q. 92. And that is true? Is the titre generally higher or lower than the melting point?

A. I don't recall.

Q. 93. But it is either one or the other?

A. Yes, I assume so; I think you would probably find it under different conditions, but you would find that where you were making the tests to indicate the hardness of the matter you would be very apt to use the titre, or the melting point, or the congealing test. You would not use all the tests; so that when you say something higher or lower, that does not necessarily follow. If you are making a test for certain material—in the buying of raw material for our soap factory, we made a test on it for titre, not for melting point or congealing point; so that I cannot tell you whether the melting point was higher or lower than the titre; but I am rather inclined to think that there is a difference.

Q. 94. Did you ever make any titre tests yourself?

A. Oh, many years ago I made some titre tests.

Q. 95. Did you ascertain the iodine value of these products that were then produced by Mr. Kayser in January or February of 1908?

A. No; I don't think so; I don't recall that we did.

Q. 96. By "we," you mean Mr. Kayser and other employees of the Procter & Gamble Company?

A. Those who were working on these matters.

Q. 97. Do you know what the iodine value was?

A. I presume that they were saturated. They had no iodine value.

Q. 98. They were fully saturated?

A. Probably so. There was an effort—the effort was to accomplish that; we made the effort and our effort was to saturate them as much as possible.

Q. 99. How did you determine whether or not they were saturated? Did you take samples from time to time of the oil and ascertain its hardness?

A. Well, I don't recall.

17 Q. 100. You don't remember whether or not during the progress of the operation, samples were taken from time to time?

A. Oh, yes; there were; I do recall there were samples taken from time to time.

Q. 101. That was the regular procedure, to take samples from time to time?

A. In experimental work, yes.

Q. 102. That is only done on experimental work?

A. No. It is owing to what you are trying to accomplish.

Q. 103. These samples were permitted to cool and you ascertained their relative solidity by looking at the samples?

A. Something of that kind.

Q. 104. You mean that was the fact?

A. No, I don't; I don't think it was the fact; I mean it was something like that. You saw the material and got some idea of its value and appearance.

Q. 105. That is to say, from time to time you took samples of oil that was undergoing the hydrogenizing; that is, you withdrew them from the apparatus and permitted them to cool, to ascertain the progress of the reactions, is that a fact?

A. Well, I don't think that is the fact at all, nothing like the fact, because where you are operating, if you had other indications of progress for your work, you would run the thing until you thought it was about finished, when you had got it about finished you would take samples to see what progress you had made.

Q. 106. What were those other indications?

A. One would be the rapidity of the absorption of hydrogen; that would be a very valuable indication of the progress.

Q. 107. How did you ascertain the absorption of the hydrogen?

A. Well, the apparatus we had—the hydrogen was intro-

18 duced through a pipe and you could very easily determine the way in which the hydrogen was being taken up in the apparatus.

Q. 108. By measuring the amount of hydrogen it would absorb?

A. No; we wouldn't measure it; we could see how fast the machine was taking it, how fast it was going in there.

Q. 109. Let me see if I understand you. You say that hydrogen was being introduced into the machine and that by observing the amount of hydrogen that was being forced into the machine, you could tell the progress of the work?

A. I did not say anything about it being forced into the machine. I said the rapidity with which the hydrogen was taken up into the machine.

Q. 110. How did you ascertain that?

A. I remember very well one little operation they had, very common in the laboratories; a little mercury column indicating the pressure that was in the machine. Hydrogen is introduced in there and you are enabled to determine whether the machine has a little pressure, or a little vacuum, on it. If they thought the vacuum was beginning to get too high, they would introduce more hydrogen. It was just an easy way of regulating it.

Q. 111. This mercury column was connected with the apparatus itself into which the hydrogen was introduced?

A. Yes.

Q. 112. And your procedure was to introduce into that receptacle a charge of hydrogen?

A. We kept the hydrogen going in all the time. The hydrogen would be taken up and we had to replace it.

Q. 113. How did you know when the reaction was completed?

A. Well, of course, you couldn't tell; but you could tell how the reaction was going on by the rapidity with which the hydrogen was absorbed—was taken. Now, I have said that.

19 Q. 114. How did you determine when the operation was completed?

A. Well, when we thought that the operation was drawing near to the close of its activities, we would take samples of it to find out what had happened there.

Q. 115. So you did takes samples from time to time to determine the progress of the reaction?

A. I don't think so, not from time to time. I don't know what your meaning is, "from time to time." We took it at the end of our process and if we thought that the material was getting hardened, we took samples to see if it was being hardened.

Q. 116. I suppose this mercury column to which you refer would show leaks in the apparatus, as well as to show the progress of the hydrogenizing?

A. I don't recall that it was used in that way.

Q. 117. What became of the samples produced by Mr. Kayser?

A. I don't know.

Q. 118. Was no use made of them at all?

A. No use was made of them, except that they served their use when we found out what they were.

Q. 119. Well, what were they?

A. Samples of hardened material.

Q. 120. Did you ascertain the iodine value of these products?

A. Possibly, I don't recall it.

Q. 121. Do you remember what the iodine value was?

A. I do not.

Q. 122. Did you determine the melting point, or the titre of these products.

A. I would suppose so; in fact I think that was one of the ideas.

Q. 123. In what quantities were these products produced by Mr. Kayser in January or February, 1908?

A. In small quantities. At that time the apparatus was small and as I recall it, it had a capacity of about twenty pounds, but of that I am not sure. Even my memory is not good enough to recall the exact size of that machine.

20 Q. 124. How many charges of twenty pounds, approximately, would Mr. Kayser treat in a day?

A. Oh, I don't know; I don't think he treated over one a day. I think it was done with the idea of experimentation entirely, simply carrying it on from day to day with the development of the investigations.

Q. 125. Did the process take the entire day for the hydrogenizing of the oil?

A. I don't think so.

Q. 126. Do you remember how long it took approximately?

A. It was a variable time; sometimes a larger amount of catalyzer, and different temperature, or higher pressure, or something, would produce results that were faster than other results; so that it would vary, I think, from one hour, or two, up to eight or ten hours, according to what they were doing. My mind is not clear on that.

Q. 127. That, as you say, depended upon the proportion of catalyzer to the oil?

A. And general conditions.

Q. 128. The temperature, the pressure, etc.?

A. The effect of the catalyzer, the character of the material they were working—everything.

Q. 129. And on all of these various products that he produced under these varying conditions, it was necessary to withd w samples and ascertain the progress of the re-action?

A. Well, I don't think so. I don't know why you put that idea into my mind; I never said so and it has never been the case.

Q. 130. Do you know that it was not the case?

A. Yes; I know it is not the case.

Q. 131. Do you know that they did not withdraw samples of the product undergoing treatment.

A. I never saw it done.

21 Q. 132. Who else knew about that matter except yourself?

A. You see, in carrying on the process, you had your temperatures to maintain, and you had your re-actions to maintain; the stopping of the process to take a sample would stop the whole thing and there would be a distinct loss there. There was really no object and no sense in taking them. We were trying to saturate the material and that was indicated by the absorbtion of hydrogen. I can't say we did not take samples, but in the ordinary conduct of things there was no occasion to take samples.

Q. 133. This re-action which was carried on was a progressive

re-action, I take it? That is to say, the hydrogen was gradually absorbed and the oil gradually hardened, is that the fact?

A. Yes, it is. What else?

Q. 134. Then we agree that this re-action—that is to say, the addition of the hydrogen to the oil in the presence of a catalyst, is a progressive re-action, in which the solidification point of the oil is gradually raised and the iodin value gradually decreased?

A. I think so.

Q. 135. Then knowing the iodin value of the original oil, it was possible for Mr. Kayser to carry on the re-action gradually until he reached a point at which the product had the desired iodin value, and there stop the process?

A. Possible, yes—possible—I think so.

Q. 136. By ascertaining the iodin value of a product one determines the extent of saturation of the product?

A. I understand so.

Q. 137. Do you remember what was the iodin value of the cottonseed oil which Mr. Kayser was working at that time?

A. No; I do not.

Q. 138. Did they make any attempt to ascertain the
22 iodin value of that oil?

A. I don't remember. I suppose so.

Q. 139. Who would know?

Q. 140. Who would know?

A. I suppose it might be indicated in some report of Mr. Kayser's. Of course the iodin value of cottonseed oil is well known.

Q. 141. What is the iodin value of cottonseed oil?

A. Within a variable amount to probably—approximately 110.

Q. 142. And that was approximately the iodin value of the oil with which Mr. Kayser was working at that time?

A. I should suppose so.

Q. 143. Did you know the iodin value of the liquid fatty acids of the oil with which Mr. Kayser was working at that time?

A. No.

Q. 144. Do you know whether any determination of that iodin value was taken at that time?

A. I do not.

Q. 145. Was it customary with the Procter & Gamble Company to make such determination?

A. No; I think not.

Q. 146. With the product of the oil they were using?

A. No; I think not—not at that time.

Q. 147. Prior to November 10, 1910—That was the date of your application?

A. Yes.

Q. 148. Did the Procter & Gamble Company make any determination as to the iodin value of the liquid fatty acids of cottonseed oil?

A. Oh, I presume they made a great many of them.

Q. 149. What method of ascertaining the iodin value was followed?

Mr. Allen: That is objected to.

A. I don't know.

23 Q. 150. As soon as it was ascertained that the process which Mr. Kayser had brought to the Procter & Gamble Company was operative, did you then undertake to build a larger apparatus, for the purpose of practicing that process?

A. We undertook to make a larger experimental plant.

Q. 151. When was that plant completed?

A. I don't remember; probably in a couple of months—I do not recall.

Q. 152. Then you undertook the hydrogination of cotton and other oils on a larger scale, did you?

A. Well, now, it might help things a little if I would tell you something about it?

Q. 153. Go ahead?

A. We built an experimental plant and found the facts could be hardened successfully. Then we built a larger experimental plant so as to develop the process and the apparatus, and then we constructed a manufacturing plant on a large scale, which was in operation—I think, started in February—I think the first charge came out on February 15, 1909. Now, that may help you and save you a number of questions.

Q. 154. Thank you. In the second plant which you say was for experimental purposes, which was on a larger scale than the first plant which Mr. Kayser operated, what was the capacity of the apparatus?

A. That would be just a guess—fifty pounds.

Q. 155. And that process was in general the same as that which had been previously practiced by Mr. Kayser?

A. Yes—practically the same.

Q. 156. Did Mr. Kayser practice this process in this large plant in February of 1909?—Let me see if I get the facts correctly?

A. February, 1909, we started the large plant.

Q. 157. My question is, did Mr. Kayser then practice that

24 process?

A. Mr. Kayser worked in the plant, in the large plant there, supervised the technical end of it for some little time; I don't know exactly how long; not very long, but some time thereafter the plant was got in operation they used Mr. Kayser in a technical way over in his own laboratory. He had practically little or no direction of the work in the actual plant itself.

Q. 158. Now, going back to this second plant which was started in operation within a couple of months after January or February, 1908: Was the product produced by that apparatus, or by that process, subjected to any analysis or other treatment to ascertain the iodin value of the product?

A. I can't recall about that; I don't remember. You see, in making this material, our effort and the sole effort, was toward making a saturated material. That was indicated by its hardness. Its iodin value had little or no importance to us.

Q. 159. What was the approximate melting point of the product produced in that second plant?

A. Well, it was very much the same as the other material. My recollection of it is, that they would report that somewhere about 60, 59, 60, 61 or 62.

Q. 160. Speaking now in terms of Centigrade?

A. Titre—Centigrade.

Q. 161. You are referring now to the titre, but not to the melting point of the product?

A. Whatever that report was; I think it must have been the titre; practically everything is reported in titres, and the effort was to give them somewhere about 60.

Q. 162. You had various products produced, however, which had a lower melting point than that which you have given?

A. Well, the effort was to make a saturated material, and wherever we didn't get that we didn't look upon it as a successful operation.

25 — 163. In such case, however, the hydrogenation had not been carried on to the same extent as where you had a higher titre?

A. Of course there hadn't been the same saturation. The effort was the same, to get the same thing. If, for some reason—You see, where you are running an experimental apparatus, you run it for time and temperature; if for any other reason there was some peculiarity in the raw material, something in the catalyzer, some impurity in the hydrogen, something, things we didn't know at that time, but afterwards found a reason for, running the material with these fixed conditions, as we understood them, for a certain length of time, expecting to get a certain result—if that result was not equal to that, if we got a lower test on our material, then that was not so successful as something that produced higher tests.

Q. 164. That was not so successful from the standpoint of an effort to produce hard material?

A. Hard material—that was where our effort was at that time.

Q. 165. Was any of that material shipped from the plant during the year 1908?

A. Yes.

Q. 166. When did the first shipment of it occur?

A. Well, that is a matter of record at our place. I don't know when it was.

Q. 167. Do you know approximately when it was?

A. I have given you that date once, Mr. Allen—have you it?

Mr. Allen: It was in May, 1908, I think.

A. Somewhere about that time, about May, 1908.

Q. 168. Where was that material sent?

A. Sent to the McCaw Manufacturing Company, Macon, Georgia.

Q. 169. How much of it was sent?

26 A. My recollection is that it was 500 pounds.

Q. 170. And that was material that was produced by the second plant?

A. Yes.
Q. 171. After it was completed?
A. Yes; that is my recollection.
Q. 172. Prior to May, 1908?
A. That is my recollection of it.
Q. 173. Were the reports which were made from time to time by Mr. Kayser touching the product which he produced in these several early plants, kept and preserved?
A. I think so, though I have never seen them since then—That I am not sure about.
Q. 174. In whose custody would they be, Mr. Burchenal?
A. They would be in the office at Ivorydale.
Q. 175. Did these reports show the titre of the products that were produced?
A. I should think so.
Q. 176. What else would they show?
A. Well, I am not certain; offhand I would say those earlier reports showed nothing else.
Q. 177. When did the reports begin to show determinations other than the titres?
A. I wouldn't be sure about that, but I should think somewhere about the latter part of 1909, or 1910.
Q. 178. Did anyone else beside Mr. Kayser make reports as to those products that were produced, during 1908?
A. I don't think so. The process was a secret one and was not put in our general laboratory at all.
Q. 179. These investigations which Mr. Kayser made were in his own laboratory?
A. Special physical laboratory we had there for carrying on this experimental work.
27 Q. 180. That was a special laboratory fitted up for Mr. Kayser?
A. For experimental work.
Q. 181. Why was the material shipped to the McCaw Manufacturing Company in May, 1908?

The same objection, instruction and answer as heretofore noted, with the same notice by counsel for the defendant.

Q. 182. What became of that material which was shipped to the McCaw Manufacturing Company?

The same objection, instruction and answer as heretofore noted, with the same notice by counsel for the defendant.

Q. 183. Do you know what became of that material which was shipped to the McCa*ll* Manufacturing Company, in May, 1909?

The same objection, instruction and answer as heretofore noted, with the same notice by counsel for the defendant.

Q. 184. Did you ever see that material, or any product containing that material, subsequently to the time it was shipped?

The same objection, instruction and answer as heretofore noted, with the same notice by counsel for the defendant.

Q. 185. Was that material used for making a food product?

The same objection, instruction and answer as heretofore noted, with the same notice by counsel for the defendant.

28 Q. 186. When you became acquainted with Mr. Kayser in October or November of 1907, was that the first time that you were actively interested in catalytic reactions, or the hydrogenizing of unsaturated compounds?

A. I think so.

Q. 187. And you personally had done no work in connection with such process before that time?

A. None.

Q. 188. Did you at that time in October or November of 1907, learn from Mr. Kayser where — had been previously employed?

A. I don't recall; I don't recall whether he gave me the information at that time of afterwards.

Q. 189. You did, however, acquire the information that he had been employed elsewhere in connection with the matter of hydrogeneration?

A. Yes.

Q. 190. Did you learn with whom he had been employed previously?

A. Yes.

Q. 191. Who was it?

A. Joseph Crossfield & Sons of Warrington, England; I think the style is Joseph Crossfield & Sons, Limited.

Q. 192. Do you know when it was you received this information?

A. No; I don't recall.

Q. 193. Was it prior to the time that Mr. Kayser erected that first small plant?

A. I don't recall.

Q. 194. In January or February, 1908?

A. I don't recall. It was about that time.

Q. 195. Had you then had any communications from Joseph Crossfield & Sons, Limited?

A. I think we had.

Q. 196. Touching the methods of hydrogenation?

A. I think we had, but I don't recall that they gave us any information in regard to it.

Q. 197. Did they send, or show you, any samples of hydrogenated oil?

A. I am not certain.

Q. 198. You don't remember?

29 A. No. They may have done so.

Q. 199. If they did, was that prior to October or November, 1907?

A. I am not certain—it was about that time.

Q. 200. Do you recall whether or not you did see any samples that were produced by Crossfield & Sons?

A. I don't recall; my mind is uncertain, because I afterwards saw plenty of samples produced by Crossfield.

Q. 201. When was that, Mr. Burchenal?

A. I visited Mr. Crossfield's place in 1908.

Q. 202. What time in 1908 did you visit their place?

A. I think it was on the 6th of July, as I recall it, 1908. I landed in Liverpool on the Fourth of July, I know; it was on a Saturday.

Q. 203. Then they showed you plenty of samples of hydrogenated oil?

A. Yes.

Q. 204. Those samples had been made in Crossfield's plant in England?

A. Yes.

Q. 205. Of what were the samples made?

A. They had a variety of samples there; I don't remember what they were, but they had a great many samples.

Q. 206. Some were samples of hardened cottonseed oil?

A. Yes, I think so.

Q. 207. And they had been produced by a catalytic reaction?

A. So they told me.

Q. 208. That is, through hydrogenizing in the presence of a catalyst?

A. So they told me.

Q. 209. Did you bring any of them back to this country with you?

A. I did not.

Q. 210. Were you alone in your visit to Crossfield's?

A. I was.

Q. 211. I would like to have you describe those samples you saw at Crossfield's as well as you can?

A. I can't describe them. They had the same general
30 appearance of samples that I was perfectly familiar with.

Q. 212. What was the color?

A. White, or whitish-yellow material, hard.

Q. 213. How hard?

A. Very hard—a good deal the appearance of a piece of porcelain or china—something of that kind.

Q. 214. How did it feel to the touch?

A. Hard.

Q. 215. Did you ascertain the meeting point of these samples?

A. No; they probably told me, but I don't remember.

Q. 216. Do you know what the iodin values of those samples were?

A. I do not; it must have been very low.

Q. 217. How low?

A. I can't tell.

Q. 218. Going back now to the app-ratus at your own plant: That is to say, this plant which was installed at the Procter & Gamble Company: For what were the hardened products made in April and May of 1908, used?

The same objection, instruction and answer as heretofore noted, with the same notice by counsel for the defendant.

Q. 219. Did you use any of the product, that is the hardened oil product, that was produced at these plants in 1908?

The same objection, instruction and answer as heretofore noted, with the same notice by counsel for the defendant.

Q. 220. Were those products used in the manufacture of soap?

31 The same objection, instruction and answer as heretofore noted, with the same notice by counsel for the defendant.

Q. 221. Do you know whether or not any of the hardened materials produced at the plant were put to any use?

The same objection, instruction and answer as heretofore noted, with the same notice by counsel for the defendant.

Q. 222. Were you interested in the McCaw Manufacturing Company?

A. No.

Q. 223. You were not a stockholder or an officer of that company?

A. No.

Q. 224. Is that company still in existence?

A. I am not sure; I think not.

Q. 225. By whom was it acquired?

A. Proctor & Gamble Company.

Q. 226. When was that?

A. It was either in January or February, 1909. That date would be easily ascertainable.

Q. 227. Do you know whether or not the McCaw Manufacturing Company kept any record of what was done with those 500 pounds of hardened product that was sent them in May, 1908?

A. I don't know.

Q. 228. Are any of the former employes of the McCall Manufacturing Company, who were at the plant of that company in May, 1908, now in the employ of the Procter & Gamble Company?

A. Yes. You would refer to anybody connected with the company— president, vice-president, treasurer or secretary.

Q. 229. Yes?

A. Yes.

Q. 230. Who are they?

32 A. I really don't know—Mr. W. E. McCaw, former president of the company is in the employ of Procter & Gamble Company, one of the directors of the company; Mr. James McCaw, formerly connected with the McCaw Manufacturing Company is still in the employ of Procter & Gamble Company.

Q. 231. Who was the superintendent of the McCaw Manufacturing Company at that time?

A. I don't know, I don't really know who was the actual official superintendent.

Q. 232. Can you recall the names of any other officer or employe

of the McCaw Manufacturing Company who is now employed by Procter & Gamble Company?

A. I am not sure about their names. Mr. Anderson has charge of that particular branch; so does Mr. McCaw; they both know all the employes down there of any importance that were with the company at that time.

Q. 233. Was Mr. Anderson in the employ of the McCaw Manufacturing Company?

A. No. Mr. Anderson has always been in the employ of Procter & Gamble Company; that is the only concern he ever worked for.

Q. 234. Was Mr. Harley J. Morrison in the employ of the McCaw Manufacturing Company?

A. No.

Q. 235. He is an employe of Procter & Gamble Company?

A. Yes.

Q. 236. And has been for many years?

A. Many years.

Q. 237. What are his duties?

A. His present position is chemical superintendent of the company.

Q. 238. After that first shipment of 500 pounds of the hardened product, that is, the hydrogenated cotton oil, were any other
33 shipments subsequently made during that year 1908?

The same objection, instruction and answer as heretofore noted, with the same notice by counsel for the defendant.

Q. 239. Were these subsequent shipments made to the McCaw Manufacturing Company prior to November 10, 1908?

The same objection, instruction and answer as heretofore noted, with the same notice by counsel for the defendant.

Q. 240. What was the character of the cotton oil which was treated by Mr. Kayser in January and February, 1908; that is, was it a crude oil, or was it a refined oil?

A. It was a refined oil.

Q. 241. Was it a yellow or a white oil?

A. I assume a yellow oil—it may have been a white oil.

Q. 242. Did he hydrogenate both kinds of oil, yellow and white?

A. I don't recall.

Q. 243. In the treatment of oil at the second plant which was installed, was the yellow oil so treated, or was it a white oil?

A. My recollection is that it was a yellow oil; it may have been the other, though.

Q. 244. And the iodin values of these oils approximated 110?

A. I assume so.

Q. 245. Have you effected the separation of the liquid fatty acids of any of the cotton oil treated by hydrogen?

A. You mean commercially?

Q. 246. Or otherwise?

A. I think it has been done in our laboratory.

Q. 247. But you personally never did it?
A. Never.
Q. 248. Do you know how it was done?
34 A. No.—oh, in a general way.
Q. 249. Had you done so prior to November 10, 1910?
A. You mean, had I?
Q. 250. Had you effected the separation of the——
A. Had I? I have never done it.
Q. 251. Prior to November 10, 1908, so far as you know, had anyone in the employ of the Procter & Gamble Company, or for them, effected the separation of the liquid fatty acids in any of the products which were hydrogenated by Mr. Kayser, or under his direction?
A. I never heard of it; it may have been done, but I don't know anything about it; I don't recall.
Q. 252. How early, prior to November 10, 1910, had such a separation of the liquid fatty acids of hydrogenated cotton oil been effected?
A. I don't recall that.
Q. 253. Effected by anyone in the employ of the Procter & Gamble Company?
A. I don't recall it.
Q. 254. Did Kayser, so far as you know, ever make that separation?
A. I don't know.
Q. 255. Prior to November 10, 1910, had you ever ascertained the proportions of the component glycerids of any of the products which had been subjected to hydrogenizing in the presence of a catalyst?

The same objection, instruction and answer as heretofore noted, with the same notice given by counsel for the defendant.

Q. 256. Did anyone in the employ of the Procter & Gamble Company, or acting for that company, or on behalf of Mr. Kayser, ascertain the proportions, of the component glycerids in any of
35 the products produced by hydrogenization, prior to November 10, 1908?

The same objection, instruction and answer as heretofore noted, with the same notice by counsel for the defendant.

Q. 257. Will you please to answer that question, changing the date to November 10, 1910?

The same objection, instruction and answer as heretofore noted, with the same notice by counsel for the defendant.

Q. 258. Were you familiar with the patents to Edwin Cuno Kayser, No. 1,004,035 and No. 1,008,474?
A. What are those patents? (Examining papers) I have read these patents and understand them. I have gone over them pretty carefully; I might say I am fairly familiar with them.

Q. 259. Are these patents controlled by Procter & Gamble Company?

A. No. They were.

Q. 260. But they are not now?

A. Not now.

Q. 261. Were they controlled by Procter & Gamble Company in the first half of the year 1915?

A. They were controlled by Procter & Gamble Company up to the time they were transferred to the Hydrogenation Company.

Q. 262. Since then they have not been controlled, either directly or indirectly by Procter & Gamble Company?

A. It is all by the Hydrogenating Company, in which Procter & Gamble Company have an interest and of which I am president.

Q. 263. Does the process which is described in the Kayser patent No. 1,004,035, differ materially from the process which Mr. Kayser disclosed to you in the early part of 1908?

36 A. No; I think it is practically the same.

Q. 264. Does the process described in the Kayser patent No. 1,008,474 differ materially from that described to you by Mr. Kayser in the early part of 1908?

Mr. Allen: Counsel calls the attention of the witness to the fact that the application for this patent was filed February 18, 1910.

A. I am trying to recall to mind the process that Mr. Kayser originally outlined. Now, this second patent here is materially different from what he originally stated; but when you ask me if it is something he outlined in the early part of 1908, it is very difficult for me to state whether it was different from that finally adopted there in our experimental laboratory—finally developed there in our experimental apparatus. As a matter of fact, that work was carried on there over 1908, and our experimental apparatus, besides the small and large one, was the foundation of our process, or of the Kayser process. Mr. Kayser came over to this country and the process he carried with him was experimental, as it turned out afterwards, with Crossfield. We had to carry on that experimental work here. Now, it is very difficult for me to say. If you put it in 1907, I will say it was materially different from what it was at that time.

Q. 265. In what respect was it materially different, Mr. Burchenal?

A. Well,——

The same objection, instruction and answer as heretofore noted, with the same notice by counsel for the defendant.

37 At this point a recess was taken to half-past two o'clock in the afternoon of the same day, Wednesday, October 4, 1916, at which hour the same witness was further examined as follows:

By Mr. May:

Q. 266. Referring to the interview you had with Mr. Kayser in October or November, 1907, when he told you that he had a process

for hydrogenizing of oils and showed you the samples he brought with him, did he state to what use those hydrogenized oils might be put?

A. Yes.

Q. 267. What did he say as to that?

A. Used for soap-making purposes.

Q. 268. Did he limit his statement as to the possible use to soap making only?

A. That was the principal use.

Q. 269. Did he limit the use to which this hardened product might be put, to soap making only?

A. Some of it might be used for other purposes, but that was its principal use.

Q. 270. What other purpose did he say it might be used for?

A. I don't recall.

Q. 271. You don't remember the other uses to which he said this might be put?

A. I do not.

Q. 272. Don't you remember that he said it might be used to make an edible product?

A. On the contrary, he said he thought it could not be used for an edible product.

Q. 273. Did he say why?

A. I don't remember that we discussed that part of it.

Q. 274. Did you discuss the matter of edibility at all?

A. I asked him if he thought it would do for edibles, and he said he thought not.

Q. 275. Did he say why not?

A. I was not asking his expert opinion at all.

38 Q. 276. What was there about the product that would prevent its being used for edible purposes?

A. Well, it did not appear to be edible; it was a very hard material, had a very high melting point, had an unpleasant taste; that would be all, I should think.

Q. 277. To what was the unpleasant taste due, if you know?

A. Due to the process of hydrogenizing.

Q. 278. Due to the process of hydrogenizing?

A. Yes; it was a characteristic taste of all that.

Q. 279. It was a characteristic taste of oil which had been hydrogenized?

A. Yes.

Q. 280. That is true to-day of oil which has been hydrogenized, that it has a characteristic taste?

A. Yes.

Q. 281. That would preclude its being used, as such, as an edible product?

A. The edible product of course is something that has a pleasant flavor, presumably. Of course, you can't tell what one man may like. I suppose it is just as edible with that taste as without it, but it wouldn't be quite so palatable.

Q. 282. But that was the same taste you refer to as making that

product of Kayser's inedible, that characteristic taste coming from the hydrogenizing process?

A. Well, of course, it don't make it inedible; but I imagine that had its effect upon the people who originally made hydrogenized material; they found it was a very hard material with a peculiar taste and they just probably assumed that it was inedible.

Q. 283. And that peculiar taste is a characteristic of hydrogenized cotton oil?

A. Yes; as a matter of fact, nobody had used it for edible purposes, or suggested its use for edible purposes.

39 Q. 284. But it was edible nevertheless, was it not?

A. As such, you mean?

Q. 285. As such.

A. That I don't know.

Q. 286. Did it have a characteristic odor due to the hydrogenizing process?

A. Yes.

Q. 287. And does cottonseed oil, when hydrogenized, have that characteristic odor?

A. Yes.

Q. 288. Does that militate against its being used as an edible product?

A. Well, of course, all oil that has been hydrogenized for edible purposes passes through the usual process of filtering, and deodorizing, so that that objection is largely removed.

Q. 289. So that to make a hydrogenated product edible, it is necessary to subject it to further processes, is it?

A. Will. I think it improves it. I don't think it is necessary.

Q. 290. Otherwise it may be used without further treatment, just as it is produced from the hydrogenizing process?

A. I should think it could be; just like all processes, though, it improves it.

Q. 291. Was that product which Kayser showed you in 1908 a homogeneous product?

A. I should think so.

Q. 292. And it was hydrogenized?

A. Yes.

Q. 293. Was it completely hydrogenized?

A. I think as completely as they knew how to do it.

Q. 294. It was an incompletely hydrogenized product, was it not?

A. That I can't tell you. It was very hard and white, I know.

Q. 295. Was there anything about that product, so far as you know now, which would prevent it having been used for edible purposes?

A. That is rather a difficult question to answer. Where a material is used for an edible product, it is usually understood that the material as originally taken, would be suitable for an edible

40 product. In other words, I would not want to take something that was very bad in its original quality, and by any process of refining, make it edible because that would be a natural offense. As it is, oils have been referred to as having been used, or as having been treated, such as fish oil, whale oil, and things of that kind;

while that material has been used for edible purposes over on the other side, I don't think anyone here would dare to make an edible product out of fish oil or whale oil and get away with it;—yet it might be, in fact, perfectly inoffensive.

Q. 296. Yet it would be desirable to start with an edible oil before hydrogenizing it?

A. You would have to start with something that would have no offense.

Q. 297. In order to produce an edible material?

A. It would be preferable to start with a material which has no offense against it.

Q. 298. Is there anything about the hydrogenizing process described by Mr. Kayser to you which would render an edible product otherwise inedible?

A. Possibly so—I am not prepared to say it would be, but possibly. If you take an oil that has a titre of 62, that melting point is so high it doesn't melt with an ordinary temperature of the human body, and that might be indigestible, might be inedible—I don't know; but you can see the possibilities there.

Q. 299. The hardened product that Mr. Kayser showed you, which had been made from cottonseed oil, except for the characteristic odor and characteristic taste due to the process of hydrogenizing to which it had been subjected, was otherwise an edible product, was it not?

A. Well, I made some little talk about that a moment ago.
41 I can repeat that. I don't know whether it is edible or not, but immediately we get off into a technical discussion there and there would be a great variance of opinion on that subject.

Q. 300. There would be various opinions as to whether a hard product would be edible, or not, from your point of view?

A. As such, yes.

Q. 301. The process of hydrogenizing consists merely in the addition of hydrogen to the original oil, does it not?

A. That is my understanding.

Q. 302. Is there anything about the addition of hydrogen to an oil which would make an oil, otherwise edible, inedible?

A. Well, I can repeat what I said a moment ago,—that you can have such a high melting point that maybe the ordinary functions of the body do not operate upon it. That I do not know—of course it is never used as such.

Q. 303. You are not sure of that, are you?

A. Sure of what?

Q. 304. Sure of your statement that it is never used as such?

A. Well, I never heard of it being used as such.

Q. 305. Then you are not sure of your statement?

A. No.

Q. 306. Now, when Mr. Kayser first used that small apparatus it had a capacity of some twenty pounds?

A. Some small amount—it may have been five—I don't recall some small amount.

Q. 307. Did you see any of the products which were not completely hydrogenized by the process of hydrogenation?

A. I don't recall any.

Q. 308. Were all of the products produced——

A. Let me modify that—absolutely complete? Approximately complete. The effort was made to carry them to a practical state of completion.

42 Q. 309. I did not ask you what the effort was?

A. Oh.

Q. 310. I asked you the simple question as to whether you saw any products that were hydrogenized by Mr. Kayser with that first apparatus which were not completely hydrogenized?

A. I don't know whether they were completely hydrogenized or not, sir.

Q. 311. Did you see any of those products which were of a semi-solid consistency, whether due to an effort to make them otherwise, or not?

A. I never remember of seeing any material worked on by Mr. Kayser in a semi-solid condition.

Q. 312. You never saw any material drawn from the apparatus at any stage of the hydrogenizing which was semi-solid?

A. I don't remember any such sample.

Q. 313. You are not prepared to say, however, that Mr. Kayser did not make a semi-solid product with this apparatus, are you?

A. No; I am not prepared to say that, as Mr. Kayser was not attempting to make any such material as that—never placed any value on that class of material and I don't see why he should have done it.

Q. 314. The latter part of the answer is objected to as immaterial. Procter & Gamble Company manufacturing soap and have manufactured soap for many years, have they not?

A. Yes.

Q. 315. And they use a hard stearin in the manufacture of that soap, do they not, or stearic acids?

A. No; we don't use stearic acid, as such; we don't manufacture stearic acid, as such, to manufacture soap.

Q. 316. In the manufacture of soap, you use stearic acid, do you?

A. Not stearic acid produced as such. Stearic acid is present in all the soap-making materials.

43 Q. 317. You have stated that at the Crossfield plant in England in July, 1908, you saw samples of hydrogenized oils?

A. Yes.

Q. 318. Did you see any samples which were not completely hydrogenized?

A. All the samples I saw were of hard material. I don't know whether they were completely hydrogenized or not.

Q. 319. Were you advised by anyone at Crossfield's for what purpose those hardened fats were used?

A. Oh, in a general way our conversation was on the subject of the use for soap-making purposes.

Q. 320. And what was the titre of the fats used for that purpose?

A. I don't remember.

Q. 321. In the previous manufacture of hydrogenized products for

use in the manufacture of soap, the titre of the fats varied, did it not?

A. I don't get that—let me have the question again?

Q. 322. I will put the question in another way: Did Crossfield & Sons, Limited, or anyone in their employ state to you what titre they desired the hardened products should have for use in soap-making?

A. No.

Q. 323. Did you gain any information whatever on that point?

A. No.

Q. 324. Now, when Mr. Kayser started the second apparatus, in the early part of 1908, at the factory of Procter & Gamble Company, did you see any material produced at any stage in the process of hydrogenizing which was semi-solid?

A. I don't recall it.

Q. 325. Such product might have been produced so far as you know?

A. It is possible—not likely.

Q. 326. Does the process of hydrogenizing change the saponification value of the original oil?

A. I presume so; I don't know.

44 Q. 327. You are not advised as to that?

A. I wouldn't like to pass an expert opinion on it; I should think it must necessarily do it, though.

Q. 328. Do you know what the saponification value of cottonseed oil is?

A. No.

Q. 329. What effect upon the resultant product did a change in the several factors of proportion of catalyst to oil, temperature and pressure, have in the hydrogenizing by Kayser of a cottonseed oil, during the early part of 1908?

The same objection, instruction and answer as heretofore noted, with the same notice by the counsel for defendant.

Q. 330. Mr. Burchenal, are you the same John J. Burchenal, patentee of Letters Patent No. 1,135,351, dated April 13, 1915?

A. I am the same.

Q. 331. I observe that you say in your patent that cottonseed oil contains 17 per cent. saturated fats, 37 per cent. linolin, and 46 per cent. olein; is that true?

The same objection, instruction and answer as heretofore noted, with the same notice by the counsel for defendant.

Q. 332. Did the cottonseed oil which Mr. Kayser hydrogenized in the early part of 1908, so far as you were informed or advised, contain 17 per cent. saturated fats, 37 per cent. linolin, and 46 per cent olein?

The same objection, instruction and answer as heretofore noted, with the same notice by the counsel for defendant.

45 Q. 333. Do you know whether or not cottonseed oil varies as to the proportions of the saturated fats, olein and linolin?

The same objection, instruction and answer as heretofore noted, with the same notice by the counsel for defendant.

Q. 334. Are you willing to say whether or not there is any difference between the process described by you in line 75 to line 86, page 1, of the specification of your patent and the process which Mr. Kayser carried out in January or February of 1908 at the plant of Procter & Gamble Company?

The same objection, instruction and answer as heretofore noted, with the same notice by the counsel for defendant.

Q. 335. Is there any difference between the process described in lines 75 to 86, page 1, of your letters patent No. 1,135,351, and the process which Mr. Kayser described to you in the latter part of 1907, or the early part of 1908?

The same objection, instruction and answer as heretofore noted, with the same notice by the counsel for defendant.

Q. 336. Did Mr. Kayser, prior to November 10, 1908, at Procter & Gamble Company plant, hydrogenize any cottonseed oil other than a yellow cottonseed oil?

A. I presume he did. I have an idea that he made some experiments there on white and crude oil, but I am not certain. Our records would show.

Q. 337. Was the product produced by the hydrogenizing of crude oil suitable for use as an edible product?

46 A. My recollection is that he did not say whether he did work on crude oil, or not. I am not certain about that.

Q. 338. Did the color of the original oil have any effect upon the color of the resultant hydrogenized product?

A. My recollection is that it did.

Q. 339. That is, if the original color of the oil were yellow, it would produce a yellow product?

A. Within certain limitations.

Q. 340. What do you mean by that phrase, "within certain limitations"?

A. I mean that a very dark oil would be apt to produce a dark hydrogenized material. A very light oil would produce a lighter colored material. When you get oils, where the amount of color in them is small, it is hard to detect the difference, probably, on the finished product.

Q. 341. Have these different oils names by which they can be identified? I am referring, of course, to cottonseed oils?

A. Cottonseed oil is graded all the way from low-grade oils to high-grade oils.

Q. 342. How are they called, what is the nomenclature applied to these various oils?

A. Well, the specifications are rather well defined under the Produce Exchange rules; summer yellow oil, prime summer yellow oil, white oil, winter white oil—all those oils have certain qualifications that are understood in the trade.

Q. 343. How about the winter oils?

A. Winter oils, winter oil of course is based generally on its chill test.

Q. 344. It is a fairly light colored or transparent oil, is it not?

A. Well, it has to be transparent.

Q. 345. In other words, it is not a yellow oil?

A. Yes, it is a yellow oil.

Q. 346. But not yellow such as the summer yellow oil?

A. Yes.

47 Q. 347. How about winter white oil?

A. Winter white oil is a white oil.

Q. 348. The hydrogenizing of winter white oil produces a white product?

A. Well, you would have to have an oil that would be bleachable; yellow oil might not be bleachable.

Q. 349. If you used, therefore, a yellow oil for the hydrogenizing process, would you produce an edible product?

A. You might, or might not; it would depend on the character of the oil. If your oil was not edible to start with, I would hardly consider it edible afterward.

Q. 350. But, if it were edible to start with, any product produced by hydrogenizing would be edible?

A. I would think so.

Q. 351. In order that we may be at one in our understanding, I will ask you to explain what you mean by "homogeneous" in reference to a hydrogenized product?

A. My understanding of "homogeneous" is that it is similar throughout; that is, that it would be different from the ordinary compound which is made of hard and soft material.

Q. 352. And you would not call a compound a homogeneous mass?

A. I would not so consider it in the strict understanding of the word.

Q. 353. So that you are using the word in its restricted sense when you say a product is homogeneous? Was the product, was the hardened product which Kayser was producing, homogeneous?

A. Generally the same product throughout.

Q. 354. Is cottonseed oil homogeneous?

A. I think so.

Q. 355. I am merely trying to arrive at a clear understanding of your use of the term. For instance, would you call chocolate ice cream a homogeneous compound?

48 Mr. Allen. I object to that as incompetent.

Q. 356. I am merely trying to get his understanding of the term "homogeneous"?

A. Well, in taking chocolate ice cream, if you were to speak of chocolate ice cream itself, as comparing one chocolate ice cream

with another chocolate ice cream, you are simply considering chocolate ice cream. You might say one chocolate ice cream is homogeneous and the other is not. Where you are speaking of chocolate ice cream as distinct from other products, the chocolate ice cream would be a mixture of several ingredients and I should hardly think you would call it homogeneous.

Q. 357. In other words, you make this distinction, that where the ingredients of the product tend to separate, the product would not be homogeneous, would you so say?

A. Why, certainly I would think in that case it would not be homogeneous.

Q. 358. And for that reason you would assume that a compound made of cottonseed oil and hard hydrogenated fat, if you please, which would tend to separate into layers, would not be a homogeneous product?

A. That would be my idea in that particular case.

Q. 359. I am referring to the matter of the homogenity and trying to ascertain just what is meant by the term "homogeneous," and that would be one of the tests that you would consider in determining whether or not the product is homogeneous?

A. It would certainly influence my own opinion about it.

Q. 360. In asking you the following question, Mr. Burchenal, I am not attempting to pry into any secrets of Procter & Gamble Company with respect to soap making. I am asking this question merely generally to ascertain the hardness of the hydro-
49 genized fats which are used in soap making. In the manufacture of soaps in which hydrogenized fat is used, what approximately is the titre of the fat?

Mr. Allen: The question is objected to as irrelevant and immaterial, and the witness is instructed that he need not answer.

A. I decline to answer.

Q. 361. At the risk of asking the same question a second time—Will you please state to what use, if any, the product produced by Mr. Kayser upon the second apparatus which he manufactured and used at Procter & Gamble Company's factory, was put?

The same objection, instruction and answer as heretofore noted, with the same notice by the counsel for defendant.

Q. 362. Was such product used in the manufacture of soap?

The same objection, instruction and answer as heretofore noted, with the same notice by the counsel for defendant.

Q. 363. Was it used for any edible purposes?

The same objection, instruction and answer as heretofore noted, with the same notice by the counsel for defendant.

Q. 364. In asking these questions I am referring, of course, to the product which was produced by Mr. Kayser prior to November 10, 1908, and would your answer be the same if I repeated the question, thus confining my question?

The same objection, instruction and answer as heretofore noted, with the same notice by the counsel for defendant.

50 Q. 365. When you went to visit the Crossfield concern in England in July of 1908, Mr. Kayser was then working for you and you had learned that he had been an employe of the Crossfield concern?

A. Yes.

Q. 366. Did you state to the Crossfields that Mr. Kayser was working for you?

The same objection, instruction and answer as heretofore noted, with the same notice by the counsel for defendant.

Q. 367. Did you make any inquiry as to Mr. Kayser and what he had done in England, from the Crossfields, during your visit to that concern in 1908?

A. No.

Q. 368. Did you mention him at all?

A. I don't believe I did; I don't recall that I did.

Q. 369. Did they mention him?

A. I don't recall that they did.

Q. 370. Mr. Crossfield subsequently visited this country?

A. Mr. George Crossfield.

Q. 371. When was that?

A. As I recall it, it was in the summer of 1909.

Q. 372. Do you know whether or not Mr. Kayser was employed at any time prior to November 10, 1910, by Joslyn-Schmidt Company, of Cincinnati?

A. I never heard of it. I don't believe he was.

Q. 373. Do you know where Mr. Kayser is now?

A. I think Mr. Kayser is in Holland.

Q. 374. In Holland?

A. I think so; we had word from him the other day, some month or six weeks ago, requesting us to communicate with him in Holland; that he had been liberated by the British Government; that they had decided he was a German citizen and sent him back to Germany, but that he was on his way to Holland, where he expected to stay.

51 Q. 375. Previous to his liberation by the British Government, Mr. Kayser had been interned in the camp for German prisoners, had he not?

A. Near London; that is my understanding.

Q. 376. Is Mr. Kayser a stockholder of Procter & Gamble Company?

A. Yes.

Q. 377. Has he any other connection with Procter & Gamble Company other than a stockholder?

A. He has been in the employ of the company continuously.

Q. 378. And is now?

A. Is now, in an advisory capacity. He has been doing some research work for us. He thinks his correspondence with us on some matters that he has been working on, is what led to his arrest.

Q. 379. You have said in respect of Mr. Kayser's work that he made reports to the officials of the Proctor & Gamble Company touching the product which he made in the latter part of 1907 or the early part of 1908?

A. I don't think he did anything really of any consequence before 1908.

Q. 380. Well, in 1908 then—would you be good enough to make search for those records and produce them? I will confine my question to reports touching the product produced by Mr. Kayser's process of hydrogenizing prior to November 10, 1908?

A. Mr. Kayser left this country in July, 1910, and in the main his records, or any reports which he made, where they have been preserved, were at Ivorydale under the charge of Mr. Anderson, the General Superintendent of the company. Those reports have been made to Mr. Anderson. We can get them for you, if our attorneys recommend it.

Mr. Allen: I see no objection to that.

52 Q. 381. Will you do that then?

A. Yes.

Q. 382. At the same time will you get that other correspondence?

A. I will see if we can find it.

Q. 383. Mr. Anderson was acting in that capacity for Procter & Gamble Company during Mr. Kayser's employment, was he?

A. General superintendent of the company.

Q. 384. And he was familiar with the work Mr. Kayser was doing?

A. Yes.

Q. 385. And reports were made by Mr. Kayser to Mr. Anderson?

A. Yes.

Q. 386. And it was from Mr. Anderson that you obtained your knowledge of the reports?

A. Oh, no; I was in touch with them daily.

Q. 387. Do you know whether or not in the hydrogenizing of oil by Mr. Kayser at Procter & Gamble Company prior to November 10, 1908, nickel soaps were formed in the product by hydrogenizing of the oil?

A. I do not.

Q. 388. Do you know what would cause the formation of such nickel soaps?

A. Well, I can only surmise.

Q. 389. What would be your surmise?

Mr. Allen: Objected to as irrelevant and immaterial and the witness is instructed he need not answer.

Q. 390. Do you know whether or not Mr. Kayser produced, during this early period inquired about, namely, prior to November 10, 1908, any hydrogenized fatty oils which he mixed or otherwise used in connection with other oils?

A. Never heard of it.

Q. 391. Would the mixture of that hydrogenized oil with an

unhydrogenized oil change the character of the hydroge-
53 nized oil?

A. I should think not.

Q. 392. Would it change the character of the edible——

—. Now, it might—I will say I don't know. I don't think so.

Q. 393. Would it change the edibility of the hydrogenized oil?

A. I should think it would.

Q. 394. Make it inedible?

A. My theory would be that it perhaps might not be edible before, but would be edible afterward.

Q. 395. Did any one of Procter & Gamble Company, other than Mr. Anderson and yourself, know the process and see the products which were *pro* produced by Mr. Kayser during the first half of the year 1908?

A. Yes.

Q. 396. Who were they?

A. I can't tell you exactly who it was. The work on the process was kept very close. Mr. Procter knew something of it, but he didn't keep in close touch with it; he knew something of it, and Mr Leach, at Ivorydale knew something of it, I think, in 1908. I am not sure about Mr. Leach. In 1908 very few people knew anything about it at all; I can't tell you exactly who it was, but there must have been two or three people there who knew something of the process.

Q. 397. Who would know who these people would be?

A. Mr. Anderson would know. I speak of Mr. Leach, because he had charge of the plant which was operated there, commenced work in February, 1909. I am not sure he knew anything about it in 1908.

At this point on adjournment was taken to ten o'clock of the following day, Thursday, October 5, 1916, at which time the hearing was resumed as follows:

54 The taking of depositions was resumed pursuant to adjournment, counsel present as heretofore noted.

JOHN J. BURCHENAL, resumed the stand and was further examined as follows:

By Mr. May:

Counsel for Procter & Gamble Company produces the original correspondence with Mr. Kayser before he came to this country, for the inspection of counsel for the defendant, and withdraws his objection to the introduction of this correspondence, if counsel for the defendant wishes to introduce it.

Q. 398. Refreshing your recollection, Mr. Burchenal, by an inspection of these letters, are you able to state approximately when Mr. Kayser first came to the office of Procter & Gamble Company and when you first met him?

A. These letters do not refresh my mind; but I judge from the correspondence that Mr. Kayser must have first visited us during the latter part of November, possibly the first of December—very early in December. My impression still is that it was November; though my testimony has shown that it was in October or November, I see now it was impossible for him to have been here in October, 1907.

Q. 399. Prior to January, 1909, were you interested in the Buckeye Cottonseed Oil Company?

A. Yes. You mean me—personally?

Q. 400. Yes?

A. Yes.

Q. 401. Did that company manufacture lard compound?

A. No.

55 Q. 402. At the time that Mr. Kayser visited this country, in the latter part of November, or early in December, 1907, did the Procter & Gamble Company manufacture lard compound?

A. No.

Q. 403. Were you familiar, prior to January, 1908, with the manufacture of lard compound?

A. I knew in a general way how it was done; I was not familiar with it; I had seen it done, but never had done it myself.

Q. 404. How were such lard compounds generally made?

(Objection as immaterial and irrelevant and the witness is instructed he need not answer).

Q. 405. Were such lard compounds made by the addition to cottonseed oil of a relatively hard fat?

(Same objection, instruction and answer, with the same notice by counsel for defendant as heretofore noted).

Q. 406. Prior to November 10, 1908, did Procter & Gamble Company manufacture any lard compound?

(Same objection ,instruction and answer, with the same notice by counsel for defendant as heretofore noted.)

Q. 407. Prior to November 10, 1908, did Procter & Gamble Company manufacture or sell any product containing, or embodying hydrogenated fat?

(Same objection, instruction and answer, with the same notice by counsel for defendant as heretofore noted.)

56 Q. 408. Prior to November 10, 1908, did Procter & Gamble Company manufacture and sell any edible product consisting of, or comprising or embodying a hydrogenated fat?

(Same objection, instruction and answer, with the same notice by counsel for the defendant as heretofore noted.)

A. Witness states: I would like to correct my testimony, if I can,

to show on the record, in regard to a question that was asked yesterday. It might help you some?

Q. 409. I have no objection, personally, to your correcting your testimony, as my desire is to elict the facts?

A. I thought it might assist the line of inquiry you are making just now—and that was, when we first started our experimental apparatus at Ivorydale, I was under the impression that later in the year we made a larger apparatus. It seems that larger apparatus was not installed until after the practical plant started in 1909; but the apparatus we had in the experimental plant, where we were working in an experimental way, had a capacity of twenty pounds, and the ordinary charge that was run during that period was sixteen pounds to a charge; that no larger apparatus was installed until after the first of January, 1909.

Q. 410. Let me see if I understand you correctly: You testified yesterday that within a couple of months after January, 1908, Mr. Kayser built a larger apparatus?

A. Yes.

Q. 411. Capable of hydrogenating a charge of approximately fifty pounds of oil?

A. Yes; I don't remember the amount.

Q. 412. And you now desire to correct your testimony by stating that that larger apparatus was not made for Mr. Kayser
57 until after you had begun commercial operations in the plant which was completed in 1909?

A. Yes.

Q. 413. When was that commercial plant set in operation?

A. The 15th of February, 1909.

Q. 414. And it was after February 15, 1909, that Mr. Kayser made a larger apparatus than the first one which he had used and which would be capable of hydrogenerating approximately fifty pounds of oil at a time?

A. I am not sure about the size of the apparatus. When I was giving my impression, I was under the impression that we had such an apparatus. I can't find a record of such an apparatus of fifty pounds.

Q. 415. Well, was there any other apparatus built by, or for Mr. Kayser in the interim between the operation of the first apparatus in January and February, 1908, and the installation of the commercial apparatus in 1909?

A. I don't find any record of any other apparatus. The impression I had must have been from something that was in contemplation or discussion. It is hard to keep these matters clear for years, going back as far as they do.

Q. 416. Then the 500 pounds of hardened fat which was sent to McCaw Manufacturing Company in May, 1908, was produced by this first apparatus which was made by, or for Mr. Kayser?

A. Well, that is the fact, it was; it was made in the small apparatus.

Q. 417. When you discussed with Mr. Kayser his process in December, 1907 and January and February, 1908, did he not indicate

that the hardened fat might be used for any purposes for which it was adaptable?

A. I don't think so.

Q. 418. Do you remember whether he did or not?

A. I think the idea he had in his mind was that it was
58 for soap-making purposes; I think that is all he had.

Q. 419. When did you first become acquainted with the fact that Mr. Kayser had filed an application for letters-patent for a process of hydrogenating oil?

A. The application of Mr. Kayser for letters-patent was made at my suggestion.

Q. 420. Were both of the Kayser applications, which resulted in letters-patents, Numbers 1,004,035 and 1,008,474, made at your suggestion or with your approval?

A. I don't recall as to the second patent; but when Mr. Kayser came to us and we found we were making arrangements with him, for his services and for his knowledge, I suggested to him that he look into the process and see those things that he would be rightly entitled to patent as his invention. Those things were put into the patent applications at that time.

Q. 421. My question was, whether or not both of these applications were filed with your knowledge and approval?

A. They were filed with my knowledge and approval—certainly with my approval.

Q. 422. And you do not claim to be the inventor of any of the processes, or parts thereof, which are described in the specification of these two Kayser patents, do you?

A. No.

Q. 423. In the manufacture of soap, has it not been customary for many years to add tallow, or other hard fat, to softer oils for the production of soap?

A. You mean the general custom? I presume it has, but I do not know.

Q. 424. Was that ever done by Procter & Gamble Company?

The same objection, instruction and answer as heretofore noted, with the same notice by counsel for the defendant.

59 A. I will answer yes—and prior to Mr. Kayser coming to this country.

Q. 425. In carrying out the process by Mr. Kayser in the early part of 1908, was the hydrogenated product filtered?

The same objection, instruction and answer as heretofore noted, with the same notice by counsel for the defendant.

Q. 426. Was the hydrogenated product produced by Mr. Kayser in the early part of 1908, deodorized?

The same objection, instruction and answer, with the same notice, by counsel for the defendant as heretofore noted.

Q. 427. Was the hydrogenated product produced by Mr. Kayser

in the early part of 1908, or at any time prior to December 10, 1908, subjected to a Fuller's Earth treatment?

The same objection, instruction and answer as heretofore noted, with the same notice by counsel for the defendant.

—. 428. Was the product produced by Mr. Kayser, or under his direction as the result of the hydrogeneration of cottonseed oil, subjected to any treatment whatever, after the step of hydrogenating the oil?

The same objection, instruction and answer as heretofore noted, with the same notice by counsel for the defendant.

Q. 429. In the manufacture of an edible food product from hydrogenated oil is it not better that the hydrogenated product
60 be filtered to remove the nickel catalyst and be otherwise treated, to remove the characteristic taste and ordor resulting from the hydrogenation of the oil?

A. It depends entirely upon the manner in which the oil would be hydrogenated. Under some methods it is not necessary to filter out the nickel, because no nickel would be left in it; as for the deodorizing, of course that is simply a question of taste; it would not be essential to its edible properties to remove it.

Q. 430. Where a nickel catalyst is mixed with the oil and subjected to agitation in the presence of hydrogen under pressure, is it not necessary, to produce a commercially edible product to subject the hydrogenated product to filtration for the removal of the catalyst and for the removal of the characteristic taste and odor resulting from the process of hydrogenation?

The same objection, instruction and answer as heretofore noted, with the same notice by counsel for the defendant.

Q. 431. In your opinion, Mr. Burchenal, assuming the process of hydrogenation to be as described in my previous question, would it not be essential for the production of a commercially edible, homogenious, lard-like food product, to remove, by filtration, the catalyst from the hydrogenated product, and otherwise to treat t[illegible] product, to remove or destroy the characteristic odor and taste resulting from the hydrogenation process?

The same objection, instruction and answer as heretofore noted, with the same notice by counsel for the defendant.

61 Q. 432. For the production, of an edible food product consisting of an incompletely hydrogenized vegetable oil, is it not necessary or essential that the hardened product resulting from the hydrogenation of cottonseed oil, under pressure, at a temperature of 155° Centigrade, in which a catalyst is mixed with the oil and subjected to agitation, be filtered and subjected to further treatment before it becomes a commercially edible food product, as described?

The same objection, instruction and answer as heretofore noted, with the same notice by counsel for the defendant.

Q. 433. I understood you to say yesterday, Mr. Burchenal, that the processes carried on by Mr. Kayser were kept a close secret. Has the secrecy of that process been maintained ever since?

A. In a general way, I think not.

Q. 434. What do you mean by "in a general way?"

A. I mean that the number of people who are familiar with the process has been enlarged. The general working of the process is understood as carried on at our plant by people who are not connected with the business, and the number of people who are familiar with it in the plant has been largely increased. People know what we are doing and in a general way how we are doing it.

Q. 435. Will you permit outsiders to inspect or follow the Kayser processes, including the production of an incompletely hydrogenized lard-like food product?

A. Not where we can help it.

Mr. Allen: The question is objected to as misleading and as an endeavor to put into the answer of the witness a matter that has not been established.

A. I withdraw my answer.

62 Q. 436. Counsel for the defendant objects to the withdrawal of the answer of the witness. Do you maintain as a secret the process by which you produce a homogenous lard-like food product, consisting of an incompletely hydrogenized vegetable oil?

A. No.

Q. 437. Do you permit the public to inspect and follow the process by which that product is produced?

A. I think the easiest answer to that is no; but I would have to qualify that. The processes under which we manufacture are patented processes, and we might or might not be willing to sell the rights to manufacture under those processes, but we own them.

Q. 438. All the latter part of the answer is objected to as irrelevant and immaterial. There are secrets which you maintain in connection with the production of a homogeneous lard-like food product, consisting of an incompletely hydrogenized vegetable oil?

A. No; I should say there was no secret process. We have methods of carrying on our work and that applies also to every branch of our business, that we are not disclosing to the public, or to anyone.

Q. 439. Are you willing to permit counsel for the defendant and his experts to visit your plant and become fully acquainted with the processes by which you produce a homegeneous lard-like food product consisting of an incompletely hydrogenized vegetable oil?

Mr. Allen: I object to that as irrelevant and immaterial, for the reason that the process is not involved in this litigation.

Mr. May: Counsel for defendant calls attention to the fact that the answer to the bill of complaint in this case sets up as a

63 defense the failure on the part of the patentee completely to disclose the whole truth necessary to the production of the product set forth in claims one and two of the patent in suit, which

claims are here sued upon, and it is to this line of inquiry that the present questions are addressed.

Mr. Allen: Counsel for the plaintiff states that the patent certainly speaks for itself in the information it gives, and it is clearly immaterial and irrelevant what particular process and methods are employed by Procter and Gamble Company, or by anyone else.

A. We are not willing that you should visit the plant.

Q. 440. You have said that you make this product by a patented process. Who was the patentee of that process?

Mr. Allen: That is objected to as irrelevant and immaterial and the witness is instructed he need not answer.

A. I decline to answer.

Counsel for the defendant gives the same notice as heretofore noted.

Q. 441. When you visited the Crossfield and Sons, Limited, in July of 1908, whom did you meet?

A. I met Mr. John Crossfield, Mr. George Crossfield, Doctor Markel and several other men whose names I have forgotten.

Q. 442. Did you visit any other concern, person, firm or
64 corporation during that trip to Europe at that time, who were hydrogenating oils?

A. No, I do not recall that there was any other concern hydrogenating oils.

Q. 443. Did you meet Doctor Wilhelm Norman on that trip?

A. No, I never saw him.

Q. 444. Or Doctor Fred Bedford?

A. No, I never saw him.

Q. 445. Or Mr. Mose Wilbuschewitsch?

A. No, I never met any of them—I never saw them.

Q. 446. When Mr. Kayser was negotiating with you, or Procter and Gamble Company, in the last of November or December, 1907, were you aware of the fact that he was negotiating with others who were producers of edible food products?

A. No.

Q. 447. Do you know it now?

A. No. Do you?

Q. 448. Yes?

A. I never heard of it before.

Q. 449. Can you recall when it was that you finally arrived at an understanding with Mr. Kayser regarding his process, and by "you" I mean of course Procter and Gamble Company?

A. Well, I conducted all the negotiations. We drew up a tentative contract with him—that is a matter of record—in January or February, 1908, and finally made a complete contract I think in June, 1908. That was supposed to be a final contract, but it was not a final contract. The final contract was drawn in 1909.

Q. 450. I asked you yesterday if you had ascertained the iodin value of the samples of hydrogenated oils which Mr. Kayser brought

with him to this country. I would like to ask if you ascertained the iodin value of any of the products that were made by Mr. Kayser or under his direction, prior to November 10, 1910?

A. Well, my recollection would be that some methods had
65 the iodin values determined on them, but there are reports to show everything that we have on record in regard to Kayser's work.

Q. 451. Do you know whether you ascertained the iodin value of the liquid fatty acids with any of this product of Kayser's prior to November 10, 1910?

A. I don't think so. Now, you are referring to Kayser's product?

Q. 452. Made by Kayser, or under his direction?

A. I don't think so.

Q. 453. You mean to make a distinction between products that were produced by the Kayser processes, and other products produced by processes of hydrogenization?

A. No—I make a distinction between the work that was done by Mr. Kayser and the work that was done outside of Mr. Kayser's.

Q. 454. Until the time that the large plant was installed in 1909, was not the production of hydrogenated products carried on by Mr. Kayser, or under his direction?

A. My recollection is that it was carried on altogether under Mr. Kayser and his direction.

Q. 455. So that whatever products were produced during that time were produced by Mr. Kayser?

A. I should say so.

Q. 456. And in accordance with his process?

A. Yes. That would be up until February 15, 1909.

Q. 457. And after that time the hydrogenated products were not produced under Mr. Kayser's direction, or in accordance with Mr. Kayser's process?

A. After the plant was started in February, 1909, Mr. Kayser worked in the plant there for some little time afterward, I should say for possibly two or three months. After that he had no direct charge there and a diminishing connection with the place, but the material was produced and manufactured in that plant u der
66 the processes covered by the Kayser patents.

Q. 458. And under the direction of Mr. Kayser, so far as he had outlined his process?

A. No; not under his direction at all.

Q. 459. But in accordance with the previous production which he had given?

A. No. It was under the process of the patent. He ceased to have any connection with the company at all, to know the kind of work that was being done there, to know the character of material worked on. He was working over in a laboratory remote from the place, on experimental work, research work; he was not in connection with the actual operation of the plant at all.

Q. 460. But the processes which were carried on were the Kayser processes?

A. Were the Kayser processes.

Q. 461. And the products which were produced, were produced by the Kayser process?

A. Yes.

Q. 462. Is the process which is described in your Letters Patent in suit, number 1,135,351, anything more than the Kayser process?

A. I don't understand it applies to any process.

Q. 463. You evidently misunderstand my question. I asked you to say whether or not the process which is described in your Letters Patent in suit, is anything more than the process which was devised or followed by Mr. Kayser, which is patented in the Kayser patent?

The same objection, instruction and answer as heretofore noted, with the same notice by counsel for the defendant.

Q. 464. Is the process which is described in your Letters Patent in suit, that is in the specifications of your Letters Patent,
67 anything more than the process which had been practiced by Mr. Kayser prior to the installation of the large plant in 1909?

The same objection, instruction and answer as heretofore noted, with the same notice by counsel for the defendant.

Q. 465. Do you claim to be the inventor of the process described in the specifications of your Letters Patent for the hydrogenization of liquid fats?

The same objection, instruction and answer as heretofore noted, with the same notice by counsel for the defendant.

Q. 466. I noted that in your Letters Patent the statement is made that, "According to the present invention the amount of hydrogenization desired is carefully regulated and limited." How is that carefully regulated and limited?

A. I suppose it might be limited in a great many ways; but as a matter of fact we limit it by the examination of material and stop the flow of hydrogen when the material has reached a certain point, which comes up to our specifications, which we determine by tests.

Q. 467. How do you regulate the hydrogen?

A. The flow of hydrogen is regulated by a valve.

Q. 468. And you withdraw samples from time to time from the apparatus?

A. Yes.

Q. 469. To see how the reaction has been progressing?

A. Yes.

Q. 470. And when you think it is hard enough, that the product is hard enough, then you stop the process?

A. Oh, no; not at all. We have various tests that we subject that material to, when it reaches a point that answers our pur-
68 pose, comes up to our requirements for the material, then the process is stopped.

Q. 471. Then it is necessary to experiment from time to time, during the progress of the reaction, to see whether or not the material

has finally reached a point where it will conform to the prescribed tests?

A. No; we do not experiment; we test.

Q. 472. I did not ask you if you experimented with the tests. My point is that you have to experiment by withdrawing from time to time?

A. No; we do not experiment at all.

Q. 473. We need not quibble over words. I will put it this way: Do you have to withdraw samples of the product from time to time and examine them, to see whether or not they reach the point where they conform to the required tests, in order to know when you have reached that point?

A. Yes, that is so.

Q. 474. Is it possible for anyone, so far as you know, to carry on the processes described in your specification, without from time to time withdrawing samples to ascertain how far the reaction has proceeded?

A. I suppose it would be possible. It is not our method of doing it.

Q. 475. What are the tests to which you subject these samples as they are withdrawn from time to time?

The same objection, instruction and answer as heretofore noted, with the same notice by counsel for the defendant.

Q. 476. Is that one of your secrets?

A. That is one of our methods.

69 Q. 477. Is it one of your secret methods?

A. I would not say it was a secret method. The methods we use are well known.

Q. 478. If the methods are well known, have you any objection to stating what they are?

Mr. Allen: That is objected to as entirely irrelevant, immaterial and not proper. The object of counsel objecting to irrelevant and immaterial questions is to prevent encumbering the record with matters that are not material and not relevant and to prevent any confusing of the issues. What the witness might be willing to do or say is entirely immaterial.

Q. 479. Do you, in point of fact, decline to state to what tests these samples were from time to time subjected as they were withdrawn from the hydrogenizing apparatus in accordance with the process described in the specification of your patent in suit?

A. I would feel that while our methods are those well known to scientific people, nothing is peculiar about them, yet we are making a material that is very exact in its standards and simply as a matter of commercial intelligence I would prefer not to state just our exact procedure.

Q. 480. In producing a homogeneous, lard like food product, consisting of an incompletely hydrogenized vegetable oil, is it necessary from time to time to subject the samples withdrawn from the hydrogenating apparatus in the process of hydrogenation, to tests in order to determine whether the product is such a food product?

A. Above question is objected to as incompetent and the witness is instructed he need not answer unless he wishes.

70 Q. 481. What is your answer?

A. I don't think it is necessary at all,

Q. 482. The Procter and Gamble Company found it necessary to do so, did they not?

A. No.

Q. 483. They did do it, though, did they not?

A. We did.

Q. 484. And always have?

A. No.

Q. 485. How are they able to determine the hydrogenated product was a lard like food product consisting of an incompletely hydrogenized vegetable oil without withdrawing a sample from time to time to ascertain how the reaction progressed?

A. Well, that is a peculiar question. I suppose we did take samples from time to time, but the point I had in mind was the necessity of the testing of it.

Q. 486. How did you know whether or not they were lard like, without testing?

A. From appearance.

Q. 487. Is that all?

A. Well, it is my recollection that at one period that was the principal test. You see in carrying on the processes, they progress rapidly, to take material from the apparatus—we had no time to make any tests of the titre or iodin value or melting point—well, possibly the melting point, certainly not the titre or iodin value. You simply had to judge from the physical appearance of the material.

Q. 488. What is the physical appearance of lard?

A. Well, it is a material that is, according to my views of lard, in a general way, it is something that is soft to the feeling, at a normal temperature, has a translucent whitish appearance, it is not hard or brittle and it has a certain kind of plasticity to it. It is not granular, but lends itself to moulding. I suppose you might say it is homogeneous. It is of peculiar quality, I suppose; it is

71 the one that of all the natural fats has made it adaptable for domestic purposes in cooking.

Q. 489. How does that description which you have given differ from the lard compound?

A. Lard compound is quite different in appearance. Lard compound is softer than lard itself; the fats have not the same characteristic, lard compound is not of translucent appearance; it has a foamier look to it; it has not the same consistency. I don't think anybody that is familiar with both of them would confuse one with the other.

Q. 490. Then you would not consider a compound lard like?

A. And yet I would say it was hard like in appearance, in consistency, that it is like, but not the same.

Q. 491. Does the product which is withdrawn from the hydrogenating apparatus after being subjected to the process described in your specifications of the letters patent in suit, have this appearance?

A. No, no, that which comes from the apparatus is liquid, hot, and would more correspond to the appearance of the lard when it was heated.

Q. 492. And without further treatment, when it is permitted to cool, does it have this lard like, appearance which you describe?

A. It depends entirely upon how it is cooled. It has to be subjected to the ordinary treatment for such material.

Q. 493. What is that treatment?

A. Run over a lard roll.

Q. 494. What else?

A. Well, it is subjected to the ordinary process, in all cases, a filtration a deodorization and then run over a lard roll.

Q. 495. And the product as it comes from the process described in the specification, has to be subjected to these various treatments before it becomes lard like?

A. Yes; lard is treated in that way.

72 Q. 496. You said yes?

Mr. Allen: He said yes, lard is treated that way.

A. Ordinary lard, if it is simply heated and allowed to stand in a barrel, would grain and would not have the appearance of commercial lard at all.

Q. 497. All that part of the answer of the witness except the word "Yes" is objected to as volunteered—Is it not a fact Mr. Bruchenal, that if the hydrogenized cotton oil which is used in the manufacture of soap would be subjected to these same treatments which you have described, to-wit, filtration, chilling over roll, etc., it would have the appearance of lard?

A. I would hardly think so.

Q. 498. Do you know?

A. I know that the oil we use in our soap factory would not be good enough and it would not make a very attractive piece of lard.

Q. 499. Why wouldn't it be good enough?

A. In all probability the flavor would be inferior and the color would be inferior.

Q. 500. Otherwise, however, if you used a high grade oil and it were subjected to these treatments which you have described, a lard like product would be produced?

A. If it was hydrogenized to the same point so as to produce the same condition of the oil, it would, and it would be the same thing.

Q. 501. What is the titre of the hardened fat which you used, the hardened hydrogenated fat which you used in the soap-making?

The same objection, instruction and answer as heretofore noted, with the same notice by counsel for the defendant.

73 Q. 502. Do you know how hard the hydrogenated cotton seed oil must be before it can have the general appearance of lard, which you have described, after being subjected to these various operations of filtration, deodorization, chilling, etc.?

A. You mean in point of titre?

Q. 503. In point of titre, or melting point, either?

A. I know where it would—about where it would do the best, to conform to ordinary commercial conditions. It would depend entirely upon the temperature in which it was to be used.

Q. 504. I will ask the Examiner to read you the question again and I would be glad to have you answer it? (Last question read:)

A. I think there is quite a range there, that it would be possible to say it was a lard-like material.

Q. 505. What would be the range?

The same objection, instruction and answer as heretofore noted, with the same notice by the defendant.

Q. 506. I am advised and informed that when Mr. Kayser came to this country, it was his intention, or he had in mind, to produce by hydrogenation from vegetable oils, a food product; do you know whether this information is correct?

A. I believe it would be incorrect, because he stated to me that it was not suitable for a food product.

Q. 507. Because of the taste and smell?

A. Well, he didn't say why it was. I don't remember discussing the matter.

Q. 508. I do not wish to know any of the details of the arrangements you may have with Crossfield, either directly or through the medium of the Hydrogenation Company; but I would like
74 to have you state whether or not there is some working arrangement with Crossfield touching these Kayser patents and the Burchenal patents?

A. We have an agreement with Crossfield.

Q. 509. And this agre. . .t would restrict the imparting of information by Crossfield touching the process carried on previous to 1910, by Crossfield?

A. I was trying to think of the date of our arrangement with Crossfield; I think that was May, 1909—and it only applied to the process as I recall it—to the application of patent by Kayser. It had nothing whatever to do with the Burchenal patents. I want to refresh my mind on that contract. I think that contract was completed and executed in 1909.

Q. 510. So that in general closed their mouths respecting the Kayser process and the process which had been carried on in their works, prior to that time?

A. No; the arrangement only protected us in this country from any rights they had over here—I mean their arrangement to protect us; not "only"—it did protect us. I would not care to disclose——

Q. 511. I am not inquiring into that. You would regard it, would you not, as a breach of faith on the part of Crossfields, if they disclosed any information to your competitors regarding the process of hydrogenation which might produce products akin to that set forth in the patent in suit?

A. We would consider it a breach of faith if they disclosed any information regarding the hydrogenation of fats.

Q. 512. Is Mr. Kayser under agreement or obligation not to dis-

close any matters, any process or product which he produced for Procter & Gamble Company while in this country?

A. Mr. Kayser is under agreement not to disclose any in-
75 formation regarding anything that he did for us.

Q. 513. You said that subsequent to the time when you saw Mr. Crossfield, of the Messrs. Crossfield in England, you made a contract on behalf of the Procter & Gamble Company with the Crossfield's, touching matters of hydrogenation of fats; during this interim, were negotiations being carried on between the Procter & Gamble Company and the Crossfield's?

A. Practically none.

Q. 514. I am informed that Mr. Crossfield came to this country in the summer or late spring of 1909 and endeavored to enter into negotiations with others in this country as to the processes of hydrogenation, etc.; was it subsequent to that visit of the Messrs. Crossfield to this country that you made your final arrangements with the Crossfields?

A. It is my recollection that George Crossfield came over here in May or June of 1909, to try to interest a number of soap manufacturers—soap makers, here, to buy it; was unsuccessful and went back. I think our subsequent negotiations with them which led to a contract must have been in September—about that time, probably.

Q. 515. Who went to England to get that contract?

A. Mr. W. E. McCaw.

Q. 516. Between the time that you had met Mr Crossfield in England and the time when the contract was made with Crossfield, had you learned the processes which were being carried on by Crossfield for the production of a hardened fat by hydrogenation?

A. We probably had.

Q. 517. And had you learned to what use the product had been put by Crossfield?

A. We thought we had.

76 Q. 518. And did you know that Mr. Normann—Doctor Wilhelm Normann, was working with Crossfield on the production of hydrogenated products?

A. My understanding was that Doctor Normann was not working very close to them; that is, he was not doing very much work there—he was doing it himself—they were in consultation; that was my understanding.

Q. 519. Did you know that Doctor Normann had supervised the erection of a plant for the production of edible hydrogenated fats from liquid oils?

A. No; I never heard of it.

Q. 520. Do you know whether or not that is the fact?

A. I do not.

Q. 521. Did you know that Mr. Wilbuschewitsch had erected a hydrogenating plant for the production of edible hydrogenated fats?

A. No.

Q. 522. Have you since learned it?

A. I don't know it now. Where is it?

Q. 523. Did you know that hydrogenated fats had been used in the production of edible products during that interim?

A. What interim?

Q. 524. Between your visit to Crossfield in July, 1908, and the making of that contract with Crossfield in 1909?

A. I would say yes, we made that ourselves—made them ourselves.

Q. 525. Did you know that anybody else did?

A. No; I never heard of that.

Q. 526. When did you commence making them?

A. February 15, 1909.

Q. 527. That was the first edible, hydrogenated fat you had produced?

A. The first we ever produced in a commercial way.

Q. 528. You have limited it to "Commercially." I asked you whether or not that was the first time you had produced any edible product of hydrogenated fat?

77 A. We probably produced material—in fact, did produce material in an experimental way, that might be called edible.

Q. 529. I don't understand what you mean by your expression that "It might be called edible?" Just what do you mean by that?

A. I don't know that we ever determined whether they were, or not.

Q. 530. Up to that time you did not know whether the materials were edible or not, after being hydrogenated?

A. Oh, we were satisfied they were.

Q. 531. How did you satisfy yourselves?

A. From examination and from our opinion of them.

Q. 532. Did you eat them?

A. I did not.

Q. 533. Did anybody, so far as you know?

A. I don't know; I think very likely they did.

Q. 534. That is guesswork on your part?

A. That is guesswork—or lack of recollection.

Q. 535. Did this product consist of incompletely hydrogenized vegetable oil?

A. At that time, February 15, it did not—or at least the material that was hydrogenated was a hard material and supposed to be as near completely hydrogenated as we could do it in a practical way.

Q. 536. How long after that did you first produce incompletely hydrogenated food product?

Mr. Allen: I object to that as indefinite and misleading, unless counsel defines what he means.

Q. 537. Well, how long after that was it that you first produced a food product consisting of an incompletely hydrogenized vegetable oil?

Counsel for the plaintiff interposes the same objection as above noted.

78 A. Well, I think our first record on that is some time in 1909. I would like to qualify that, however, so as to show

that that material was not produced in a commercial way at that time, and was experimental.

Mr. Allen: The answer of the witness shows that he has not understood the question. The witness evidently is referring to the food product, which patent is involved in this litigation; while the inquiry was so indefinite as not to confine it.

Q. 538. My inquiry included the food product on the same terms in which it is described in Claim One of the patent in suit?

Mr. Allen: Counsel calls attention to the fact that the inquiry did not so specify the product.

Q. 539. When did you first produce a homogeneous, lard-like food product consisting of an incompletely hydrogenized vegetable oil?

A. To the best of my recollection that material was produced early in the first half of 1910.

Q. 540. Somewhere between the first of January and the first of July, 1910?

A. There is rather a confusion there as to years; it is difficult for me, without refreshing my mind on the thing—it is hard for me to say just when that particular material was produced. It goes with a certain chronology of buildings that we have out there, and the erection of a plant. How was that material described,—so that I can answer the question—"When did you first produce?"——

79 Q. 541. Yes—your product?

A. Would that mean on a commercial scale?

Q. 542. No; I asked you when you first produced it?

A. Well, there is a confusion of dates there. I would like to refresh my memory on that.

Q. 543. Very well, you may do so. How would you refresh your memory, Mr. Burchenal?

A. I would look at our records.

Q. 544. Do you say that the first production of that material took place with reference to the erection of certain buildings?

A. Yes.

A this point a recess was taken to half-past two o'clock in the afternoon of the same day, Thursday, October 5, 1916, at which time the same witness resumed the stand and was further examined as follows:

By Mr. May:

Q. 545. You were subpœnaed by the defendant, were you not, Mr. Burchenal?

A. Yes.

Q. 546. Are you now prepared to answer the question which was asked you previous to the noon recess, to-wit: When did you first produce a homogeneous, lard-like food product, consisting of an incompletely hydrogenized vegetable oil?

A. Why, I had done a good deal of experimental work on the

material; I think I am safe in saying that the date on which that material was first produced in any appreciable quantities was after April 26, 1910, and in all probability, prior to July first, 1910.

Q. 547. When did you first produce it in inappreciable quantity?

A. In an experimental way, I should say about October or November, 1909.

Q. 548. In what quantity was it then produced?

80 A. I think our records would show that it was produced in—— The amount of charge in the machine I don't remember—I don't remember what that was, five or six hundred pounds, probably—my mind is not clear on that. That was experimental. I don't remember—we might have produced five or six hundred pounds, or experimented with five pounds; we were not attempting to manufacture it, or to produce it for sale; we were experimenting.

Q. 549. What experiments did you make with it?

A. Oh, we made a great many experiments, covered the whole field from beginning to end, the whole field of its production and sale, the improvement of it—it is a long thing to tell.

Q. 550. Was this product deodorized that you first produced?

A. I do not think so.

Q. 551. Had it been filtered to free it from nickel?

A. I should think so.

Q. 552. Don't you know?

A. I am sure it must have been.

Q. 553. Had it been subjected to a Fuller's earth treatment?

A. I don't recall about that.

Q. 554. How was it deodorized?

A. Well, if it was deodorized, it was deodorized in our regular apparatus for that work.

Q. 555. That does not answer the question? I asked you how it was deodorized? What was done to it to deodorize it, that is, if it was deodorized—you said you did not know?

A. Well, it was deodorized by ordinary methods, driving off the odor with steam vapors.

Q. 556. But you do not know whether it was deodorized, or not?

A. I don't recall.

Q. 557. Was it passed over a chilling-roll?

81 A. We made some experiments about that time on methods of chilling it. We had no regular lard roll there, but we adopted some substitutes for it.

Q. 558. What was the temperature? To what temperature must the chilling rolls be reduced in order that homogeneous food product consisting of an incompletely hydrogenized vegetable oil, should be lard-like?

A. I think the range of temperature is fairly large on that thing, but the material has to be quickly chilled. Maybe it applies to all such material, that it has to be quickly chilled so as not to allow of a separation of the hard and soft material, in a material that has hard and soft materials. If you have hard parts in it, why, there would be a tendency to separate, or as we call it, to grain, if it takes a long time to chill.

Q. 559. Did this homogeneous product, consisting of an incom-

pletely hydrogenized vegetable oil, have hard and soft portions which would otherwise separate if it were not quickly chilled?

A. Well, I am not certain about it.

Q. 560. You have said that the rolls might be chilled within a wide range. Within what range?

A. Some fifty degrees.

Q. 561. Please state the temperatures?

A. I don't know; I don't recall them; I don't know the temperature there even now.

Q. 562. You don't know the temperatures they were.

A. I don't recall them.

Q. 563. The temperatures that were necessary to produce that homogeneous lard-like food product, consisting of an incompletely hydrogenized vegetable oil, as stated in the patent in suit?

A. I do not recall the temperatures.

Q. 564. Did you ever know it?

A. Oh, yes.

Q. 565. What was it?

A. I don't recall it.

82 Q. 566. When did you first know it?

A. I don't know when I first knew it.

Q. 567. The temperature of the chilling-roll has a great deal to do with the appearance of the product, as to whether it is lard-like or not, has it not?

A. It has a value, I should think an important value in the appearance of your product.

Q. 568. In order to make it lard-like, you would have to have the proper temperature of the rolls over which the product is chilled? Is not that the fact?

A. I say, it is a pretty wide range of temperature. I don't recall those things after eight or ten years.

Q. 569. Is it not a fact that whether or not that product is lard-like depends largely upon the temperature to which the roll is chilled.

A. Not the exact temperature; I say, there is a wide range.

Q. 570. But it depends upon some temperature?

A. Some range of temperature.

Q. 571. You don't know what those ranges of temperature are?

A. I don't recall them, no.

Q. 572. In order to produce a homogeneous lard-like food product, consisting of an incompletely hydrogenized vegetable oil, one must know the range of temperatures to which the chilling-rolls must be chilled, must one not?

A. I should think if a man were going to make a material, he would have to find out something about it, or he couldn't do it. The temperatures are very easily ascertainable in making lard, or a lard compound, or in chilling this material.

Q. 573. In other words, he would have to experiment with this material at different temperatures of the chilling-rolls in order to ascertain whether it would be lard-like, or not?

83 A. I should think that he would, if he had not some previous knowledge about the thing.

Q. 574. Prior to the filing of the applications which resulted in the patents in suit, Patent No. 1,135,351, had you, or had any one in your behalf, ascertained the proportions of the component glycerides, to-wit, theolein, linolin and saturated fats, contained in cottonseed oil?

Mr. Allen: Counsel for the plaintiff objects to the question as irrevelant and immaterial, and the witness is instructed that he need not answer it.

A. On advice of counsel I decline to answer.

Mr. May: Counsel for the defendant gives the same notice regarding the preceding question as has previously been given in respect of other questions which the witness has declined to answer under instruction from counsel for the plaintiff.

Q. 575. Prior to the filing of the application which resulting in the patent in suit, had you, or had any one in your behalf, ascertained the proportions of olein, linolin and saturated fats in the produce described in the specifications of the patent as originally filed, in which the said product was said to have a melting point ranging from 36 degrees Centigrade to 43 degrees Centigrade?

Mr. Allen: Mr. Allen: Counsel for the plaintiff objects to this question as immaterial and irrelevant, and the witness is instructed that he need not answer it.

84 A. On advice of counsel I decline to answer.

Mr. May: Counsel for the defendant gives the same notice regarding the preceding question as has previously been given in respect of other questions which the witness has declined to answer under instruction from counsel for the plaintiff. Counsel for defendant gives notice that in due course he will move the Honorable Court to direct the witness to answer the foregoing questions which the witness has been instructed by counsel for plaintiff not to answer.

Q. 576. In the production of a homogeneous lard-like food product, consisting of an incompletely hydrogenized vegetable oil, is it important to the lard-like appearance of the product that it shall not come in contact with iron during the deodorization, or other after treatment?

A. I should think not.

Q. 577. Is it important, to preserve the lard-like appearance, that the material undergoing treatment during any stage of its production, should be kept from discoloration by iron?

A. I should think not.

Q. 578. If the original oil which is subjected to partial hydrogenization for the production of a homogeneous lard-like food product, is a yellow oil, will the product be lard-like in appearance?

A. It might be.

Q. 579. Don't you know?

A. It may be; it may not be.

Q. 580. Won't you explain your answer, giving the conditions under which it would be, and under which it would not be lard-like in appearance?

85 A. Well, in my opinion yellow oil may be bleachable, or may not be; it would depend somewhat upon the amount of coloring matter that was in the oil originally and the character of it, whether that would be in the finished product or not.

Q. 581. So that if the original oils contained the coloring matter and were yellow, the resulting partially hydrogenized product would have to be bleached, in order to give it the appearance of lard?

A. Well, if we can think of a yellow lard, or a lard that has been discolored, it would have that appearance. I suppose your question merely applies to the color and not to the texture of the material.

Q. 582. Did Mr. Kayser have an assistant in his laboratory when he was working for you at Procter & Gamble Company?

A. He had assistance, that is, he had somebody to assist him over there.

Q. 583. Who was it, or who were they?

A. I am not clear on that, covering that time, but I think there was a young fellow there at one time by the name of Schoettlekotte; he had somebody over there to help him.

Q. 584. Is this man still in your employ?

A. This man Schoettlekotte is still in our employ. I don't know but he might have had somebody else; I don't recall; it has been a long time. Mr. Anderson can tell you and we probably have the records.

Q. 585. In the specifications of your application, as originally filed, you have described a lard substitute which can be made, by causing the oil to absorb a larger amount of hydrogen, still short of saturation, and mixing the hard product with raw oil. If this mixture were subjected to the action of the chilling rolls, would it produce a homogeneous product?

A. I should hardly think so, from my idea of a homogeneous product.

Q. 586. Would that be an incompletely hydrogenized pro-

86 duct?

A. I should think it would be incompletely hydrogenized; certainly that part that was not hydrogenized at all would be incompletely hydrogenized.

Q. 587. But you would not consider it to be a homogeneous, partially hydrogenized food product?

A. I do not think so.

Q. 588. Why?

A. Well, my thought would be that that part which had been hydrogenized would be one character of material, and that part which had not been hydrogenized at all would be another character of material.

Q. 589. So that the parts would tend to separate on being slowly cooled?

A. Might, or might not; but I would think that there would still

be a mingling, or mixing, or blending of materials without changing the character of either part.

Q. 590. But where you have a product which has a certain proportion of stearin say and a certain proportion of olein, and a certain proportion of linolin, would that be a homogeneous product?

Mr. Allen: Counsel for the plaintiff objects to the question as indefinite and misleading.

A. I don't know.

Counsel for the defendant now gives notice that on Friday morning, October 6, 1916, at 10 o'clock A. M., or as soon thereafter as counsel can be heard, he will apply to the Judge of the District Court for the Southern District of Ohio, Western Division, for an order to compel the witness to answer the previous interrogatories of
87 this deposition which the witness has refused or declined to answer, by instruction of counsel for the plaintiff, or otherwise, and the examiner is requested to certify the record to the Court for that purpose.

At this point an adjournment was taken to the following morning, Friday, October 6, 1916, 10 o'clock A. M.

The taking of these depositions was resumed pursuant to adjournment, counsel present as heretofore stated.

The Examiner having certified the record to the United States District Court for the Southern District of Ohio, Western Division, wherein the deposition is being taken, and the Judge of said Court, Hon. H. C. Hollister, having heard arguments of counsel for and opposed to a motion to compel the witness to answer the interrogatories which he had previously refused or declined to answer; and the Court having duly considered the several interrogatories, directed an order to be issued directing and instructing the witness to answer all the questions which he had previously refused or declined to answer, with the exception of Interrogatory 220; to all of which counsel for the plaintiff, Procter and Gamble Company, notes an exception.

JOHN J. BURCHENAL resumed the stand, and was further examined as follows:

By Mr. May:

Q. 591. In answer to Question 61, you stated that Mr. Kayser installed at the Procter & Gamble factory a little plant which
88 was ready to operate in January or February, 1908; and in Questions 63 and 64 you were asked to describe, as well as you might, the apparatus which Mr. Kayser used; and in Question 65 I asked you to look at a drawing forming part of the Kayser Patent, 1,004,035, and state whether a part of that apparatus shown on that drawing is similar to the apparatus which Mr. Kayser used. Will you now state, so far as you can recollect, what that apparatus

was, and state whether or not, it was like the apparatus shown on the drawing of the Kayser Patent?

Mr. Allen: The Court having instructed the witness to answer this question and other questions which counsel now, I understand, expects to put to the witness, counsel for the plaintiff wishes to enter an objection to the present question, and to those that have been heretofore objected to when renewed on the ground that they are incompetent, irrelevant and immaterial.

A. The small experimental plant installed at Ivorydale under the directions of Mr. Kayser consisted in the main of a furnace for the production of the catalyst, and a piece of apparatus similar to the one shown in his Patent 1,004,035. This piece of apparatus was for the purpose of saturating the fats and oils to be treated.

Q. 592. How was the hydrogen supplied to that apparatus, if you remember; was it through a pipe located at the end of the cylindrical tank, as shown in the drawing of the Kayser Patent?

Same objection by counsel for plaintiff, and to all further questions on this line.

89 A. I think it was, but I am not sure.

Q. 593. In the Patent Office drawing the height of the oil undergoing treatment is indicated by the broken line. Do you recall how the level of the liquid in Mr. Kayser's apparatus stood with reference to the level shown in the Patent Office drawing?

A. I do not.

Q. 594. I also note that the tank shown in Figure 1 of the patent under discussion was provided with a draw-off pipe and cock, indicated at F; do you recall whether the apparatus of Mr. Kayser was provided with such a draw-off cock or pipe?

A. I don't recall it; I think very likely it had one.

Q. 595. Then if that apparatus was provided with a draw-off pipe and cock, it would be very easy to remove from time to time samples of oil undergoing treatment without stopping the hydrogenation operation?

Same objection by counsel for plaintiff.

A. I think so.

Q. 596. Do you remember approximately the length of the hydrogenating receptacle; was it about two and a half feet long?

Same objection by counsel for plaintiff.

A. I don't recall.

Q. 597. Have you any recollection as to about how long it was?

Same objection by counsel for plaintiff.

A. If I were to make a guess at it, I would say it was about two feet long.

90 Q. 598. From a foot and a half to two feet in diameter?

Same objection by counsel for plaintiff.

This objection without further restatement to apply to all further questions on this line.

A. I should think it was over a foot in diameter.

Q. 599. That is as well as you can remember?

A. I have a very hazy recollection about the whole thing.

Q. 600. Is that apparatus still in existence——

A. I am not sure—possibly.

Q. 601. Did you see the apparatus sufficiently so as to know the construction of it; that is to say, as to the provisions of that apparatus with a foraminous material radiating from the common center, as shown in Figure 3 of the patent?

A. I was quite familiar with it at the time; but I don't recall it.

Q. 602. Do you recall whether or not it did have paddle-wheels which moved through the oil?

A. I am quite sure that at all times they had a rotating device; but I don't remember just what type.

Q. 603. Did Mr. Kayser use such devices as shown in Figures 4 to 9, inclusive, of the patent in question?

A. I don't recall. Used a great many different things.

Q. 604. You observed the operation of the device as Mr. Kayser was carrying on the process at various times in the early part of 1908, didn't you?

A. Yes, sir.

Q. 605. Was the operation carried on under pressure?

A. You mean any pressure?

Q. 606. Yes, I mean any pressure other than atmospheric?

A. Well, it was carried on under varying pressures ex-
91 perimentally, and sometimes less that atmospheric, but not much.

Q. 607. What was the range of pressures, as you remember?

A. As I recall it, the highest pressure we attempted there was sixty pounds.

Q. 608. Did a variation in pressure have any effect upon the reaction or the operation of hydrogenation?

A. Yes.

Q. 609. What effect did it have?

A. Our experiments show that an increased pressure under similar conditions produced greater activity in the catalytic reaction.

Q. 610. That is to say, if I may paraphraze your answer, you found that the reaction was speeded by an increase in pressure; do you mean anything more than that?

A. Well, I would think, broadly, yes, the catalyzer became more active. The action of the catalyzer may have been not only quicker, but it is quite possible there may have been some other differences.

Q. 611. What other differences?

A. Well, there may have been some other differences. I don't know that I recall the action. It is quite possible.

Q. 612. Did a variation in the pressure have any effect upon the resultant product?

A. I don't recall that our experiments at that time indicated that it did, other than the speed.

Q. 613. And you have since found out that it does have an effect upon the product?

Mr. Allen: I hardly think that that is a proper question. That is tending to call for possibly secret information that may have been developed in the plant of the Procter & Gamble Company. The question is objected to on this additional ground.

92 A. I cannot say that we have found that it does.

Q. 614. Well, Mr. Burchenal, I will put the question in this way: Prior to the time that you filed your application for Letters Patent in suit, had you observed that a variation in pressure during the catalytic reaction had any effect upon the character of the product produced as a result of the hydrogenation of the oil?

A. I don't recall that I did.

Q. 615. Such information as you have now has developed since you filed your application for the Patent touching this matter?

A. I cannot say that I have any information.

Q. 616. Prior to the time that you filed your application for Letters Patent in the suit, had you ascertained, or did you know whether or not a variation in the temperature to which the oil undergoing treatment was submitted, had any effect upon the resultant product being produced as a result of hydrogenation?

A. Yes.

Q. 617. What effect did it have upon the product?

A. One effect was the discoloration of the material on account of the high temperature.

Q. 618. Anything else?

A. Another effect would be the decomposition of the material comprising the higher fatty acids.

Q. 619. Anything else?

A. I presume there were other things; but I don't recall them now.

Q. 620. What temperature was necessary to produce the discoloration, or the formation of the free fatty acids?

A. I don't recall the temperature.

Q. 621. Have you not any idea at all as to approximately what the temperatures were that produced that result?

A. I could make a guess.

Q. 622. What is your best guess?

93 A. As I recall it, temperatures approximating two hundred degrees Centigrade would produce discoloration and decomposition.

Q. 623. Prior to the time you filed your application for Letters Patent in suit, did you know what effect, if any, would be produced by moisture in the hydrogen being admitted to the hydrogenation receptacle, or chamber, upon the resultant product?

A. I don't recall that I knew that, or know now. I can only surmise. I don't really recall ever trying that experiment.

Q. 624. Was pure hydrogen used by Mr. Kayser for hydrogenating oil in the early part of 1908?

A. As I recall it, the hydrogen that was used was hydrogen that was purchased in steel drums, and was the best we could get.

Q. 625. And was approximately pure, so far as you know?

A. So far as I know, approximately pure.

Q. 626. So that there was nothing in the hydrogen which was used which would otherwise render inedible the edible oil being hydrogenated?

A. I don't think so.

Q. 627. Do you remember approximately the proportion of nickel catalyst to the oil which was used by Mr. Kayser during 1908, prior to November 10th of that year?

A. As near as I can remember a number of experiments were made using different proportions; I don't recall what was decided upon at that time as the best quantity.

Q. 628. Did the variation in the proportions of the catalyst to oil have any effect upon the reaction?

A. As I recall it, it did.

Q. 629. What effect did this variation have?

A. As I recall it, within certain limitations the increase in the percentage of catalyst facilitated the operation.

94 Q. 630. You mean merely that it speeded the operation—nothing else?

A. I don't recall that my observation showed anything else.

Q. 631. Have you since that time, and prior to the filing of your application for Letters Patent in suit, ascertained that a variation in the proportion of catalyst to oil had any effect upon the resultant product?

A. Not definitely.

Q. 632. Will you please explain your answer?

A. I mean, in the course of a large number of experiments along that line we sometimes had results which indicated that perhaps there may have been something there, something that would produce a different character of product; but we have never reached any definite conclusion about it.

Q. 633. In other words, that there would be a variation in the character of the product produced due to variation in the proportions of catalyst to oil; is that what you mean to say?

A. We think it possible that there might be; but we have not reached any definite conclusion.

Q. 634. When the oil, after having been subjected to the hydrogenating treatment in Mr. Kayser's apparatus, was discharged therefrom, was it relatively black because of the presence of the nickel?

A. Yes.

Q. 635. It was quite a black substance because of the contained nickel?

A. It had a dark, inky look.

Q. 636. And as such was unfit for food?

A. Yes.

Q. 637. And that is true of a product which is subjected to hydro-

genation in which the oil is mixed with the catalyst and the oil and catalyst delivered from the hydrogenating apparatus together before the oil is filtered?

A. I should hardly think necessarily.

Q. 638. Where the catalyst consists of nickel deposited on kieselguhr, and the catalyst is mixed with the oil and subjected
95 to hydrogenation, the oil and catalyst being agitated in the meantime; and when the oil and the catalyst are withdrawn from the hydrogenating apparatus after being subjected to the reaction, the product has an inky appearance before the nickel and kieselguhr are filtered out of it, does it not?

A It has when the kieselguhr is used as we use it.

Q. 639. Well, it has under the conditions expressed in my question, hasn't it?

A. I don't know the character of kieselguhr, and of course kiselguhr as we use it is pulverulent. I don't know if there is such a thing as lump kieselguhr.

Q. 640. Did you ever see any lump kieselguhr?

A. I am not familiar with it.

Q. 641. And if the product is thus drawn from the hydrogenating chamber in this inky condition due to the presence of the nickel and the kieselguhr, it is of course unfit for edible purposes, isn't it?

A. I think so

Q. 642. Who would know, Mr. Burchenal, whether or not that apparatus which Mr. Kayser built and operated prior to November 10th, 1908, is in existence?

A. Mr. Anderson.

Q. 643. And his initials are——

A. A. E.

(Counsel for plaintiff objects to the foregoing questions, on the grounds previously notified, and counsel for defendant agree that this objection may now be made nunc pro tunc.)

Q. 644. Was cotton-seed oil hydrogenized in that apparatus made by Mr. Kayser in the early part of 1908?

A. Yes.

Q. 645. Left out.

Q. 646. And cotton-seed oil was thus hydrogenized by Mr. Kayser with the apparatus you have described, in January or February, 1908?

A. Yes.

96 Q. 647. And in the hydrogenation of the cotton-seed oil by Mr. Kayser in January and February, 1908, and in fact so long as he operated it, or practiced his process, the cotton-seed oil was heated and the reaction proceeded under pressure?

A. You mean something more than atmospheric pressure? Not necessarily, sometimes less than atmospheric pressure.

Q. 648. Was the reaction carried on at ordinary room temperature?

A. You mean the oil?

Q. 649. Yes?

A. No; the oil was heated.

Q. 650. Was heated to approximately one hundred and fifty-five degrees Centigrade?

A. I don't recall what the exact temperature was. There were experiments made at different temperatures.

Q. 651. What was the lowest temperature at which Mr. Kayser hydrogenized cotton oil in those early days?

A. I don't recall.

Q. 652. Who would know—I mean, of course, besides Mr. Kayser, as he is not available?

A. He would not know.

Q. 653. Were any records kept from time to time showing the temperature and the pressure and other like conditions?

A. There were some records.

Q. 654. Are those records still available?

A. Yes.

Q. 655. And you have them out at Ivorydale, or in your office?

A. Yes, I have them.

Q. 656. Didn't Mr. Kayser have note-books showing what he did from time to time in respect of these hydrogenating operations?

A. I don't recall his note-books. He may have had them.

Q. 657. Do you remember whether or not he left them with the Company?

A. No, he didn't. I feel pretty sure that he didn't, because I cannot find them.

Q. 658. You have looked for them, have you?

A. I looked for them.

97 Q. 659. Carefully?

A. Carefully. Mr. Anderson says he never left them there.

Q. 660. Would those records which you have show the temperatures and the pressures during the hydrogenating treatment of the oil?

A. I think they would show where the test was trying to discover the effects of pressure or temperature.

Q. 661. And those would show what pressures and temperatures were used?

A. I think possibly.

Q. 662. Those records, however, would not necessarily show the lowest temperatures at which Mr. Kayser hydrogenized the oil, would they?

A. Not necessarily, but I think if he made any test indicating something he would make a report on it.

Q. 663. You were asked in Question 181, concerning a certain material which had been produced by Mr. Kayser by this process of hydrogenation, which had been shipped to the McCaw Manufacturing Company. I will repeat the question: "Do you know why the material was shipped to the McCaw Manufacturing Company in May, 1908?

A. Yes.

Q. 664. Why was it?

A. We shipped it to the McCaw Manufacturing Company because we desired them to work the material, because they had apparatus for hauling it that we didn't have.

Q. 665. There had been some talk between yourself and the officials of the McCaw Manufacturing Company regarding this material previous to the shipment?

A. The consultations we had were with the President of the Company only, W. E. McCaw.

Q. 666. Did you have these controversies with Mr. McCaw.

A. As I recall it, I had some of the conversations and Mr. Procter had some of the conversations.

Q. 667. Was the earliest conversation touching the use of this material carried on by Mr. Procter and Mr. McCaw?

A. I don't recollect.

98 Q. 668. Do you recall whether you had the first conversation with Mr. McCaw, or whether Mr. Procter had the first conversation with Mr. McCaw?

A. I don't recall.

Q. 669. Do you recall whether Mr. Procter took a sample of this hard material to Mr. McCaw prior to May, 1908.

A. He might have done so, I don't know, I think it very likely that he did; but I don't recall it.

Q. 670. You know what happened to the hard material which you shipped to the McCaw Manufacturing Company in 1908?

A. I can't say that I know.

Q. 671. Had you ever been advised as to what was done with it?

A. In a general way.

Q. 672. What did you understand was done with that hard material?

A. It was mixed in certain proportions with the cotton-seed oil, and an attempt was made to produce a lard compound.

Q. 673. How much of that compound was produced with the five hundred pounds of lard material that had been shipped?

A. I don't know.

Q. 674. Were you advised as to the proportions in which the harder compound was mixed with the oil?

A. I don't recall them.

Q. 675. Do you know approximately in what proportions they were mixed?

A. I don't recall the proportions.

Q. 676. Did you personally see the mixing of the hard material with the oil to make the compound?

A. At Macon? No, I didn't see it at Macon. I saw experiments made before it was ever made there.

Q. 677. In the experiments which you saw before that material was sent to Macon, what approximately, was the proportion of the hard material to the oil?

A. I don't recall exactly. I have a remembrance that it was something about ten per cent.

99 Q. 678. So that if Mr. McCaw of the McCaw Manufacturing Company, utilized all that hard product which was sent

to the McCaw Manufacturing Company in the making of the compound, it made quite a large amount of the compound?

A. I suppose if it was made in that proportion it would make about fifty-five hundred pounds. As a matter of fact, the first experiment on it was a failure. I don't know what they made out of it.

Q. 679. Did you ship any more of the hardened hydrogenized oil to the McCaw Manufacturing Company subsequently to May, 1908?

A. Without being at all sure about it, my recollection is that the first shipment that was made was lost, or something happened to it, and a second shipment was made.

Q. 680. When was the second shipment made?

A. That I don't recall, but it must have been two or three months afterwards. That is a matter of record.

Q. 681. So that the McCaw Manufacturing Company didn't get any of this hardened compound until after two or three months after May, 1908?

A. I should think about—I would like to have that record of it, whatever it is.

Q. 682. You mean you would like to refresh your recollection on the subject?

A. No, I would like to have the record of the thing taken from the actual fact, not a matter of recollection, but the fact.

Q. 683. I am trying to get the facts on the matter, and would be very glad to have you look that up, if you desire to, and state just what the facts are?

A. Mr. Anderson and Mr. McCaw can give you the exact information in regard to that.

Q. 684. Approximately how much of that hardened ma-
100 terial did you ship to the McCaw Manufacturing Company prior to November 10th, 1908?

A. My recollection is that there was not over two shipments that went to the McCaw Manufacturing Company at all; but the second shipment that was made, which I have in my mind, it is possible that that might have been shipped after November, 1908, though I think it must have gone before that. In any event there would be only the two shipments.

Q. 685. The one that was lost, and the other that presumably reached there; is that what you mean?

A. One of them certainly got there.

Q. 686. But you don't remember which one it was?

A. I think—I am not certain about it.

Q. 687. What was done with the compound that was made by the McCaw Manufacturing Company in which the hardened material was used; have you ever been advised as to what happened to it?

A. No.

Q. 688. Do you know whether any of it was sold prior to the 10th of November, 1908?

A. I don't know; I don't think it was; I don't think it was satisfactory material.

Q. 689. Why wasn't it satisfactory?

A. Well, it was not regarded as a good commercial material.

Q. 690. Why?

A. I don't know. I saw one sample of it. It didn't look like a good compound.

Q. 691. What was the trouble with it?

A. My recollection is that the sample that I saw was after it had been held for some time, and it had a streaky, sticky, stringy look—didn't have a good appearance.

Q. 692. How long had it been held when you saw it?

A. Well my recollection of it is very uncertain—I should say probably two or three months.

101 Q. 693. Perhaps a year?

A. Oh, no—two or three months, I said.

Q. 694. Do you know really whether or not the McCaw Manufacturing Company made up any large quantity of the compound using the hydrogenated material?

A. I don't know, but I don't think they did.

Q. 695. What became of the balance of the material which was shipped which was not used to manufacture the compound?

A. Oh, I suppose it was all used up in making a batch of material.

Q. 696. What become of all that batch of material, if you know?

A. Well, the material was unsatisfactory. I don't know what they did with it.

Q. 697. Was it adapted to be used for cooking purposes in place of lard?

A. What I saw would not have been suitable for any commercial product competing with the kind of material that is sold ordinarily for that purpose.

Q. 698. Well, I didn't ask you that, I asked you, was it adapted to be used for cooking purposes, or for edible purposes?

A. Well, the sample that I saw, I would not think so.

Q. 699. Do you know whether or not that compound which the McCaw Manufacturing Company made out of the hardened product which was shipped to the McCaw Manufacturing Company, was passed over chilling rolls?

A. I don't know that it was, I suppose it was. That is what it was sent there for.

Q. 700. You don't know whether it was or not?

A. I presume it was.

Q. 701. Was the product deodorized before it was shipped to the McCaw Manufacturing Company?

A. I think not.

Q. 702. Was the compound deodorized after the hardened 102 product was mixed with the oil, if you know?

A. I don't know.

Q. 703. It was not, however, as you say (if I correctly understand you), a commercially edible product as it was made by the McCaw Manufacturing Company; I am referring now to the compound?

A. The material I saw was not.

Q. 704. And therefore you judge that the remainder of it was no more commercially edible than that which you saw?

A. I judge it was all the same.

Q. 705. And that was true of all the compound that was made by McCaw from hardened product which was shipped within, or at the time prior to November, 1908?

A. I can't say as to that, I don't know.

Q. 706. Was the compound which was sent to you by Mr. McCaw like the compound that you had experimentally made previous to the shipment of the hardened material to the McCaw Manufacturing Company?

A. No.

Q. 707. In what respect did it differ?

A. We had no chilling rolls, we could not—we had no opportunity for working it through that part of the lard making. It was sent to the McCaw Manufacturing Company for that purpose, and for that reason.

Q. 708. So that the material that you had previously experimented and produced had not been subjected to the action of the chilling rolls?

A. No.

Q. 709. Had it been deodorized?

A. I think not.

Q. 710. Then it was not a commercially edible product?

A. Well, it was not a compound in the ordinary sense of the word; I would not say as to whether commercially edible; it might have been.

Q. 711. Did you eat it?

A. I tasted it.

103 Q. 712. Put a little piece on the end of your tongue, I suppose, tasted it in that way, and then spit it out?

A. Probably.

Q. 713. Did anybody else eat it, so far as you know; I am referring now to the compound which you produced experimentally?

A. I don't recall the circumstances.

Q. 714. Was any of the hardened hydrogenated product shipped to the McCaw Manufacturing Company by you, or the Procter & Gamble Company, prior to the time that you got your commercial plant in operation?

A. Yes; our commercial plant did not go in operation until February 15th, 1909.

Q. 715. Well, between November, 1908, and February, 1909, was any of the hardened hydrogenized product shipped to the McCaw Manufacturing Company?

A. Nothing was shipped to the McCaw Manufacturing Company except those one or two lots that have been spoken of that I recall.

Q. 716. After you got your commercial plant in operation you thereafter shipped the material to the McCaw Manufacturing Company; I mean by "material," of course, the hardened hydrogenated product?

A. After we got our commercial plant in operation we shipped material to the McCaw Manufacturing Company.

Q. 717. How soon after the plant was started in operation?

A. I don't recall the date of the first shipment.

Q. 718. Several months?
A. No; very shortly after that, probably in March.
Q. 719. That would be March, 1909?
A. Yes.

Mr. Allen: Counsel for plaintiff renews his objection to
104 the above line of examination, and to each of the questions, as irrelevant and immaterial; counsel for defendant agrees that such objection may be taken nunc pro tunc to all the said questions.

The Witness: The witness desires to make the statement that the business of the McCaw Manufacturing Company was acquired by the Procter & Gamble Company about January 1, 1909, and shipments made after that date were shipped to the McCaw Manufacturing plant of the Procter & Gamble Company.

Q. 720. Referring now to previous Questions 218, 219 and 221, which refer to the hardened product produced by hydrogenation at the plant of the Procter & Gamble Company during the year 1908, were the hardened products put to any use other than the shipment to the McCaw Manufacturing Company?
A. The quantity of material produced at that plant was so inconsequential that I cannot say what use it was put to.
Q. 721. You don't remember what use they were put to, if any?
A. No—such a small amount probably didn't know.
Q. 722. You would not call five hundred pounds an inconsequential amount, would you?
A. I think so.
Q. 723. Prior to November 10th, 1910, had you ever ascertained the proportions of the component glycerids of any of the products which had been subjected to hydrogenation in the presence of a catalyst; this is the same question which was asked you under the number of 255?
A. I think so. You say you asked me that? You mean did I ascertain by my own efforts?
105 Q. 724. Yes, had you ascertained personally?
A. Ascertained through the information of others, not by my own.
Q. 725. Had you ascertained the component gylcerides of cotton-seed oil?
A. In the same way, yes.
Q. 726. And what were the proportions of the component glycerids of cotton-seed oil?
A. As I recall it, they were varying proportions, I don't recall them exactly.
Q. 727. Well, can't you give them approximately?
A. I think in a general way the matter was reported to me as ordinary cotton-seed oil, American cotton-seed oil, containing about eighteen per cent. of stearin, about forty per cent. of olein, and the balance of linolein.
Q. 728. How had that been determined, if you know, how had those proportions been ascertained?

A. Well, I recall that as a matter of common record—publication.

Q. 729. You mean they had obtained this information through publications?

A. I think so.

Q. 730. Had those determinations been made by ascertaining the iodin value of the liquid fatty acids?

A. I suppose so—I don't know.

Q. 731. By "ordinary cotton-seed oil" you are referring to cotton-seed oil having iodin value of approximately 110?

A. Something about that, yes.

Q. 732. Do you know what the iodin value of the liquid fatty acids of such an oil is?

A. No. I think approximately——

Q. 733. It would be what?

A. I think about 150 or 155.

Q. 734. Cotton oil having an iodin value of 110, and the iodin value of the liquid fatty acids being approximately 150, do you know what would be the relative proportion of the saturated

106 fats, the olein and the linolein?

A. I think in a general way in the samples, the cotton-seed oil that we have seen reported the linolein is slightly in excess of the olein.

Q. 735. Very materially in excess of the olein, isn't it?

A. I don't recall it so, I am not certain about those things.

Q. 736. Knowing the iodin value of the original cotton oil, and knowing the iodin value of the liquid fatty acids of that oil, it is easy to calculate the relative proportions of linoleiu, olein and saturated fats contained in that oil, is it not?

A. I should think so.

Q. 737. In ascertaining the iodin value of the original oil and the liquid fatty acids, what method did you use, the Hanes, or the Huebl or the Wijs?

A. I don't know.

Q. 738. Did any one in the employ of the Procter & Gamble Company or acting for that company, or in behalf of Mr. Kayser, ascertain the proportions of the component glycerids in any of the product produced by hydrogenation prior to November 10, 1908?

A. I am not sure. I presume they did.

Q. 739. Who would know?

A. Mr. Anderson might know; Mr. Morrison might know. Mr. Kayser might know.

Q. 740. Prior to the filing of your application for Letters Patent in suit, had you ascertained the proportions of the component glycerids, in the homogeneous lard-like food product consisting of an incompletely hydrogenized vegetable oil having a range in titer of 35 to 42 degrees Centigrade?

A. I presume so.

Q. 741. Well, did you?

A. I presume I did.

Q. 742. I am not asking for an assumption, I am asking, did you?

107 A. I am assuming that I did. My memory as to just when I acquired the knowledge, I am not clear about it.

Q. 743. You really don't remember whether you did or not?
A. I rather think I did.
Q. 744. But you don't remember, in point of fact, whether you did or not?
A. Oh, I must have known.
Q. 745. Can't you answer yes, or no, whether or not you did ascertain the component gylcerids as inquired about in the question?
A. I cannot remember as to the exact state of my knowledge; but I must have known.
Q. 746. Did you, in point of fact, know it before 1912?
A. I must have known it.
Q. 747. I am not asking you as to what you guess you might have known; I am asking you definitely and positively whether you did know the proportion of component gylcerids in the product which I referred to in the previous question?
A. Well, the only way that I can state positively would be to state, to have some recollection of the exact time that I acquired that knowledge—and I don't know it.
Q. 748. Might have been either before, or after, you filed your application, so far as you can now recollect?
A. No; it must have been a long time prior to my filing of an application. You have stated how long prior to November, what was it?
Q. 749. My last question was with reference to 1912, at which time the amendment——
A. Oh, I had knowledge of those things in large numbers prior to 1912 of that particular material.
Q. 750. But had you that knowledge prior to the time that you filed your application for patent for these materials?
A. What was the date?

108 Mr. Allen: November 10, 1910.

The Witness: Oh, yes, prior to November 10, 1910, we had numerous experiments on all those things.

Q. 751. Who performed those experiments: did you?
A. No.
Q. 752. Did you ever perform any of them?
A. None of them.
Q. 753. You now say positively as a fact that you did know prior to November 10, 1910, the proportions of those component glycerids in the homogeneous lard-like food product consisting of an incompletely hydrogenized vegetable oil ranging between 35 and 42 degrees as to titer?
A. I say I must have known it, but I don't recall.
Q. 754. Referring now to Questions 264 and 265, is the process described in the Kayser Patent 1,008,474 materially different from the process practised by Mr. Kayser in the early part of 1908?
A. As I understand the patent, it is not materially different.
Q. 755. That is, the process which is described by Mr. Kayser in this patent is not materially different from the process which he

practised in the early part of 1908 at the Procter & Gamble Company's factory?

A. Yes.

Q. 756. Referring now to Question 334, is there any difference in the process of hydrogenation described in the patent in suit and the process which was carried out by Mr. Kayser in the early part of 1908?

A. As I understand that paragraph, it does not refer to any special process, except where it says "preferably"; but preference was given to the process in a general way as outlined in the Kayser patent.

109 Q. 757. That is, so far as the process is described in the patent in suit, it is the same process which Mr. Kayser had carried on in the early part of 1908, in the hydrogenation of oils, and particularly cotton-seed oil?

A. The process of hydrogenating, yes.

Q. 758. And your knowledge of this process was gained from Mr. Kayser?

A. Yes.

Q. 759. Referring now to Question 404, prior to 1908, if you know, how were lard compounds generally made?

A. I don't know.

Q. 760. Prior to November 10, 1908, did the Procter & Gamble Company manufacture any lard compound?

A. No.

Q. 761. And prior to that time they didn't manufacture or sell any edible product consisting of or comprising or embodying any hydrogenated fat?

A. No.

Q. 762. Where a nickel catalyst is mixed with the oil and is subjected to agitation in the presence of hydrogen under pressure and at a temperature of approximately one hundred and fifty-five degrees Centigrade is it not necessary, to produce a commercially edible product, to subject the hydrogenated product to filtration for the removal of the catalyst, and to other treatment for the removal of the characteristic taste and odor resulting from the process of hydrogenation?

A. I think not.

Q. 763. Do you think it would be edible without these various steps being taken?

A. It might be.

Q. 764. It might be, dependent upon what?

A. It might not be necessary to filter the material.

Q. 765. For the production of an edible food product consisting of an incompletely hydrogenized vegetable oil produced by agi-

110 tating oil in a tight closed vessel in the presence of an atmosphere of compressed hydrogen, and in which the catalyzer of finely divided nickel carried by kieselguhr is maintained in suspension in the oil, and its temperature being raised to 155 degrees Centigrade, would it be necessary, in order that such product be commercially edible, to subject the product to further treatment?

A. I should think so.

Q. 766. That treatment would include the deodorization of the product?

A. I should think that would have a value.

Q. 767. And other treatment to remove the characteristic odor and taste of a hydrogenated product?

A. I think that would be important.

Q. 768. And necessary?

A. Necessary to remove the flavor, but not necessary to make it edible.

Q. 769. It would be otherwise edible?

A. I should think so.

Q. 770. But not a commercially edible product?

A. It might even be a commercially edible product, certainly not so good as if the flavor were improved by deodorizing.

Q. 771. In answer to Question 440, you said that the product which had been previously inquired about in Question 439, had been made by a patented process. Who was the patentee of that process?

A. Mr. Kayser.

Q. 772. In Question 475, you were asked as to the tests to which you subjected certain samples that were withdrawn from time to time; will you please state what those tests are?

A. I don't know.

Q. 773. Did you know what tests the samples were subjected to from time to time?

A. Yes, but I don't now recall what they were.

111 Q. 774. Were any records kept as to those tests prior to the filing of your application for patent?

A. There was at the time, but I doubt if they were permanent records. I don't know.

Q. 775. Would Mr. Anderson know about that?

A. I should think so.

Q. 776. He would know, if any one would?

A. Yes.

Q. 777. Was the product which was produced by the McCaw Manufacturing Company, and which you said you saw and did not regard as a desirable product, in the condition in which it was because of improper chilling?

A. No, I think not. That I don't know.

Q. 778. That stringiness of the product, however, was due to improper chilling, wasn't it?

A. I don't believe so.

Q. 779. To what was it due?

A. We were not certain in regard to it: at least I am not certain in regard to it. We were under the impression that it was probably due to some peculiarity of the composition of the material.

Q. 780. Referring now to Questions 502 to 505, will you please answer now the previous Question 505, which read as follows: "505. What was the range?"

A. I don't know, never having experimented to determine the extreme ranges.

Q. 781. So that the hydrogenated cotton-seed oil might have a

great range in titer and still be treated so as to be lard-like in appearance?

A. I should think it would have quite a range.

Q. 782. Range of forty-two degrees Centigrade?

A. No, I should not think so. I should think that the range might be ten or twelve degrees Centigrade—possibly less. The titer of cotton-seed oil is about thirty-five degrees Centigrade, and the titer of the completely hydrogenated cotton-seed oil product is about sixty-two Centigrade.

112 Q. 783. Does the filtration of a partially, or completely hydrogenized cotton oil which had been hydrogenized by the use of a catalyst consisting of finely divided nickel deposited on finely divided kieselguhr remove all of the nickel from the product?

A. It is our experience that it is practically all removed.

Q. 784. Does it require a special filtration for that purpose?

A. We have not found it so.

Q. 785. What has been the method of filtration?

A. I am not entirely familiar with that.

Q. 786. Don't you know in a general way what it is?

A. We run it through a filter press.

Q. 787. Just an ordinary filter press in which filter cloths are used?

A. Yes.

Q. 788. And nothing else?

A. So far as I know nothing else.

Q. 789. And no further treatment of the product is required for the removal of the nickel?

A. We have not found it necessary.

Q. 790. So that after an oil has been hydrogenated and subjected to the ordinary filtering operation, the catalyst is sufficiently removed so that, other conditions being equal, the product is edible?

A. Other conditions being equal?

Q. 791. What I mean is, briefly speaking, that if you should start with the edible oil and hydrogenize it with a nickel catalyst as I have described it, and then subject the oil to filtration with the ordinary filter press, the product would not be rendered inedible because of any contained nickel?

A. It would be edible in that respect.

Q. 792. So that so far as contained nickel might be concerned, the product produced by Kayser, after being subjected to the ordinary filtering operation, was edible?

A. So far as nickel contents are concerned, yes.

113 Q. 793. You are aware of the fact that the saponification value of cotton-seed oil is given as approximately 195?

A. No, I don't remember what it is.

Q. 794. In the partial hydrogenation, or incomplete hydrogenation of cotton-seed or other vegetable oil, does the proportion of nickel to the oil have any effect upon the proportion of the component glycerids in the product?

A. We have made some experiments that indicate that it may have some influence; but we have never fully determined that.

Q. 795. So that in order to know in advance just what the com-

ponent glycerids of the product to be desired may be, it is necessary to know the proportion of the catalyst to the oil?

A. I should not think so.

Q. 796. Do you know?

A. We have made a number of experiments that indicate that there may be some difference, but we have not fully determined that yet.

Q. 797. In other words, your experiments show that in order to get a predetermined product, having predetermined proportions of the component glycerids, it may be necessary to know the proportion of the catalyst to oil?

A. On the contrary, my experience indicates that there may be a difference; but we have never developed anything of any special value in that line.

Q. 798. Does the amount of agitation during the hydrogenation of vegetable oils in the presence of a catalyst consisting of finely divided nickel deposited on finely divided kieselguhr, have any effect upon the component glycerids in the resultant product?

A. I don't know.

Q. 799. Did Kayser, prior to January 1st, 1909, disclose
114 to you the process which was carried on at Crossfield's in the hydrogenation of oils, and particularly vegetable oils?

A. Kayser told us that the process which he originally had brought over was the process that was being worked out at Crossfield's by him, and that he had all the information that they had on the subject.

Q. 800. Did he tell you that they had hydrogenized oil to various degrees of saturation and incomplete saturation?

A. Never told me that.

Q. 801. Did it require a greater effort on Kayser's part to produce a hard product than one less hard in hydrogenizing cotton oil?

A. I don't recall that he ever tried to produce anything but hard material.

Q. 802. Stopping the process at any time and drawing off the product would have resulted in the production of products of various consistencies, wouldn't it, due to the fact that the reaction is a gradual reaction, and the material is gradually hardened?

A. You could stop the process at any time and produce a material that was saturated up to the point of the re-action taking place at that point; it would not produce varying materials, I should not think.

Q. 803. It would produce materials varying as to hardness?

A. Depending upon the amount and length of the saturation, I should think so.

The direct examination of this witness not being completed, the further taking thereof was now adjourned to Saturday, October 7, 1916, at 9:30 A. M., at which time the further taking of the deposition was resumed, as follows:

115 CINCINNATI, O., October 7, 1916.

The taking of these depositions was resumed pursuant to adjournment, counsel present as heretofore stated.

JOHN J. BURCHENAL:

Direct examination resumed:

The witness desires to make this statement on the record: That since testifying as to the two sample lots of hardened cotton-seed oil which he thought had been sent to the McCaw Manufacturing Company, he has after thinking the matter over overnight become doubtful in his mind as to whether or not two lots were actually sent. He feels sure that one lot was sent, but from his recollection is not able to state definitely whether more than one lot was sent, or not.

By Mr. May:

Q. 804. Who was Dr. Bender?

A. Doctor Bender was our chemist.

Q. 805. Is he still connected with the Procter & Gamble Company?

A. No; he left shortly after, or left about the time that those reports that you speak of were made.

Q. 806. In 1908?

A. Yes, sir.

Q. 807. So that he is no longer with that Company?

A. No; he returned to Germany.

Q. 808. Is he still living, so far as you know?

A. I don't know.

116 Q. 809. You testified that the commercial plant for hydrogenizing oil was started in operation on February 15, 1909?

A. Yes.

Q. 810. Generally speaking, I assume that included a plant for the generation of hydrogen, a plant for the manufacturing of the catalyst, and one or more hydrogenating units?

A. Yes.

Q. 811. Approximately how long did it take to build and start that plant in operation?

A. Well, it was several months. We put up a light temporary structure covered with corrugated iron, or something of the kind. We started it probably in the fall or early winter of 1908.

Q. 812. And the building of this plant called for the expenditure of quite a large sum of money?

A. It was quite a sum—I don't remember what it was.

Q. 813. Approximately how many of the hydrogenating units did you have at first in the plant that you started in operation?

A. My recollection is we had one.

Q. 814. And that had a capacity of approximately what?

A. I remember the machine very well, but I don't remember the size of the charge. It seems to me it was about three thousand pounds I think, I am not certain.

Q. 815. And the product which was produced from this first plant was used for edible purposes primarily?

A. It was used largely for that purpose. It was all hard material.

Q. 816. How long was it before you produced any semi-solid hydrogenated material in that plant?

A. I don't think we produced any semi-solid material in that plant intentionally——

Q. 817. Till when?

A. Till the latter part of 1909.

Q. 818. When did Mr. Kayser leave this country?

A. I think he left this country in July, 1910—about
117 that time.

Q. 819. Did he return to this country again after that?

A. Yes.

Q. 820. When was that?

A. I don't recall. I think it must have been 1913, I am not sure; I can find out if you want to know. It was two or three years later (after a pause). On further reflection I think it may have been in the latter part of 1912; anyhow it was two or three years after he left this country in 1910.

Q. 821. What is the physical appearance of butter?

Objected to by counsel for plaintiff, as incompetent.

A. Butter is an animal oil of low melting-point that is mixed with the constituents of milk and presumably forms an emulsion, so that when it is chilled at the ordinary temperature of a domestic refrigerator it is plastic; it is yellow in color; and lends itself readily to spreading, and is convenient to use on the table.

Q. 822. Would you have any difficulty in distinguishing butter from lard by the physical appearance of the two substances?

A. I don't think I would.

Q. 823. In an affidavit executed by you on the 17th day of February, 1915, and forming a portion of the file wrapper and contents of the Patent in suit, you stated that a re-determination of the melting-point and tited corresponding to the iodin value of fifty-five to eighty in partially hydrogenized cotton-seed oil resulted in a certain way. Who made that re-determination?

A. I don't remember. I suppose those things were based on our determinations at Ivorydale.

Q. 824. You didn't make them?

118 A. No; I made none.

Q. 825. Well, do you know which of your chemists made those determinations?

A. No.

Q. 826. Who would know?

A. Possibly Mr. Morrison would know; possibly Mr. Anderson.

Q. 827. Mr. Harley J. Morrison?

A. Yes.

Q. 828. Under date of November 20, 1912, the composition of the partially hydrogenized oil obtained by analysis of the product prepared in the manner described in the Specification of the Patent in suit was stated to be as set forth in lines 10 and 18, inclusive, page 2, of your Letters Patent in suit. Did you make the analysis?

A. I didn't.

Q. 829. Did you see the analysis made?

A. No.

Q. 830. Or check them?

A. No.

Q. 831. Do you know who made them?

A. No.

Q. 832. The Procter & Gamble Company of which you are Vice-President and General Manager is the plaintiff in this suit, is it not?

A. I think they are.

Q. 833. In your patent in suit you state in effect that by treating cotton-seed or other vegetable oil in the manner described in lines 75 to 86, page 1, of the specification of that patent; and by stopping the operation, then the product on cooling is a white or yellowish semi-solid; is the product thus prepared from cotton-seed oil, and having a melting-point of forty-two degrees centigrade, such a semi-solid?

A. I would think so.

Q. 834. And such a product having a melting-point of forty-three degrees contigrade is a semi-solid?

A. I would think so.

Q. 835. And each such product would be homogeneous?

A. In my ideas of the meaning of "homogeneous," I would think so.

Q. 836. Would it be lard-like?

119 A. I don't know at what point it would cease to be lard-like.

Q. 837. You are distinguishing between forty-two and forty-three degrees centigrade?

A. I don't know at what point it would cease to be lard-like. As a matter of fact, I don't recall at what point it would cease to be a semi-solid, but it would be somewhere near those temperatures.

Q. 838. Such a product having an iodin value of fifty, would be a semi-solid?

A. Certainly would be at some temperature.

Q. 839. At ordinary atmospheric temperatures would it be a semi-solid?

A. I am not certain.

Q. 840. Would such a product having an iodin value of eighty be a semi-solid?

A. Yes.

Q. 841. Would such a product having an iodin value of fifty-five be a semi-solid?

A. I am not certain; it might, or might not.

Q. 842. Depending upon what?

A. I should say, depending upon the constituents of the oil.

Q. 843. Well, suppose that your original starting oil were cotton-seed oil, then what would your answer be as to such a product?

A. Well, not b- ng certain, I am inclined to think that cotton-seed oil at fifty-five might not be a semi-solid at a lower range of ordinary temperatures. In this locality we have to consider temperatures from about sixty to ninety-five Fahrenheit.

Q. 844. In your patent in suit, however, you say that "a lard-like product thus prepared from cotton-seed oil has * * * an iodin value ranging from about fifty-five to about eighty"; do you know about the truth of that statement?

A. The only doubt that I would have is whether at fifty-five it would be a semi-solid covering the entire range of what we consider ordinary temperatures.

Q. 845. It would be such a semi-solid, however as is re-
120 ferred to as being produced by the process described in the patent?

A. I should think it would be considered a semi-solid.

Q. 846. You have produced at my request the original report, if I understand it, all the original reports, that were made by or for Mr. Kayser during the year 1908 touching the process and products practiced and produced by Mr. Kayser?

A. I don't know that they are all the reports that Mr. Kayser made; but they are all the reports that we have any record of.

Q. 847. They are all the reports that you have been able to find?

A. All the reports that I have been able to find.

Q. 848. You have made, or caused to be made, a careful search?

A. Caused to be made a careful search.

Q. 849. The first of these reports is dated in January, 1908, and said report contains among other things a description of the particular catalyst which Mr. Kayser employed, and his process of making it. I don't wish to introduce it in evidence, because I have no desire to prejudice either the plaintiff in this case, or The Hydrogenization Company of which the witness is an officer, in any suit in which the Kayser patents may be involved; consequently I will ask you to read into the record only that portion of the first of the notes which relates to the treatment of the fat?

A. I do, as follows. "Demonsration by E. C. Kayser of Process for Hardening Fats, January, 1908 * * * Treatment of Fat: The oil or fat is first heated to temperature of 160° C in open pot, with gas flame to drive out every trace of water. The presence of
121 water retards the process greatly. The dried fat is then mixed with the catalizer from roaster, in proper proportion (see later notes) and the mixture placed in the saturating tank, which is fitted with wire gauze agitator, revolving at about 100 RPM.

Hydrogen gas is circulated through the machine and when all air is expelled, a gas flame is placed under the tank to heat oil to 160° C. The process of saturation is very interesting. Hydrogen is circulated as taken up by the fat. If too much is passed into the machine, the excess passes out of the outlet and is wasted. If not enough passes in a slight vacuum is created, which causes the water, in which end outlet tube is placed, to rise up in tube, sometimes 6 to 8 inches. The affinity of the fat for the hydrogen is plainly evidenced in this operation. As the saturation nears completion, less gas is, of

course, taken up by fat and an excess is circulated, which causes bubbling at end of outlet tube. Completion of saturation is indicated by comparison of volume of gas in and out of machine. When saturation is practically complete, the gas passes through without any apparent reduction in volume. The fat is drawn out of the machine—a black mass, on account of presence of catalizer, and passed through filter press, the catalizer filtering out very readily. The filtered fat is the finished product."

Q. 850. There are in addition certain reports apparently dated January 17, 1908; January 22, 1908; one dated February 6, 1908; one dated March 5, 1908; and one apparently dated May 7, 1908. I will ask if you will have the Examiner copy in the record these reports; and if necessary, will you produce them on request
122 for the trial?

A. I will do so.

Q. 851. So that the copy which is made in the record by the Examiner may be considered as a true and correct copy of these reports?

A. Yes.

(A true and correct copy, duly verified and compared, of the reports above referred to being in words and figures as follows, to wit:)

"Fat-hardening Process by E. C. Kayser.

First experimental lot was completed Jany. 17th, 1908. Fat treated—Summer Yellow Cotton-seed Oil. Used Nickel Sulphate and Keiselguhr as described. Experiment was conducted by Mr. Kayser alone. He claims to have used about 1% Nickel metal and 2% Keiselguhr.

M. P. of fat after 3 hrs. .....55½° C
M. P. of fat after 6½ hrs. .....60.3° C

Dr. Bender reports as follows:

'Melting point of fat .....60.3° C
Hydrocarbons ..... .33%
Iodine value of fat 7.14%

The fat does not contain free fatty acids. This material is much superior to the samples from J. Crossfield & Sons, which showed an iodine value of 52.26 and a melting point of 39.3° C. (The laboratory sample melted at 49.9° C.) Their samples contained 5.12% free fatty acids and 2% hydrocarbons.'

123 Mr. Kayser reports as follows: 'The melting point of fatty acid, prepared from first lot of hardened cottonseed, is 62° C. This is several points higher than I ever got before. Presumably the composition of your oil differs somewhat from that of the oil I handled formerly.'

Fat-hardening Process by E. C. Kayser.

Second experimental lot was completed Jany. 22nd, 1908. Fat treated—Summer Yellow Cottonseed Oil. Used Nickel Sulphate and Keiselguhr as described. Experiment conducted by Mr. Kayser, A. E. Anderson present several times during operations. Weight of Catalizer, as came out of

Roaster 1#	2 oz.
Fat added 22#	14 oz.
Total charge	24 lbs.

Catalizer contains 20% of Nickel Metal	3.6 oz.
Fat used weighed	389 "
Per cent. of Nickel metal	.9%
" " Keiselguhr	3.6%
M. P. of fat after 3 hours	55° C
M. P. of fat after 6 hours	60° C

Dr. Bender reports as follows:

(No Sample sent to Laboratory.)

124 *Test of Mixture of Hardened C. S. Oil & Prime Tallow.*

Feby. 6th, 1908.

= 0		Prime Tallow only	44.5 Titre
=116	1	Prime Tallow	
	15	Hard C. S. Oil	45.8 "
= 18	1	Prime Tallow	
	7	Hard C. S. Oil	46.9 "

Fat Hardening Process by E. C. Kayser.

Result of the Last two Parallel Trials.

5 hrs. at ordinary pressure	M. P. 42° C
2½ hrs. at 60lb pressure	M. P. 43° C

Temperature in both cases 160° C.
Catalyser, expressed as pure metal, 0.6lb per 100lb C. S. Oil.
March 5th, 1908.

Analysis of 'Saturated Cottonseed Oil.'

Sent Mr. W. E. McCaw, Macon, Ga., May 7th, 1908.

Titre of Fatty Acids	59.8° C
Melting Point of Fatty Acids	59.8° C
Melting Point of Neutral Fat	59.8° C
Iodine Value of Fatty Acids	11%
Nickel	0.01%"

125 Q. 852. The report as of January 17, 1908, contains a report by Dr. Bender in which he refers samples from "J. Crossfield & Sons, which showed an Iodine value of 52.26 and a melting point of 39.3° C." Where were these samples from Crossfield & Sons obtained?

A. I don't know; I presume Mr. Kayser brought them with him.

Q. 853. The material which is referred to as "C. S. O.," or "C. S. Oil" in these reports is cottonseed oil?

A. I judge so; I think so.

Q. 854. You have not any reason to doubt that?

A. I have no reason to doubt it; I believe it is.

Q. 855. The analysis dated as of May 7, 1908, is an analysis of the material which you said was shipped to Mr. McCaw at Macon, Georgia (exhibiting to witness)?

A. I judge that is what it is.

Q. 856. In the production of a partially hydrogenized cotton-seed oil, what factors are necessary to insure in the product a high olein content and a low linolein content?

A. I can't tell you.

Q. 857. You mean that you don't know?

A. I don't know.

Q. 858. And never did know.

A. Never did know.

Q. 859. Just to clear up one or two points, and then finish this deposition, please state what is meant by the "titer"?

A. Titer, as I understand it, is a test that is given fats to indicate the hardness of the material.

Q. 860. It is the solidification point of the fatty acids, is it not?

A. I understand so.

Q. 861. Now, the solidification point of a fat, however, is not the titer of that fat?

A. I should think not.

Q. 862. The characteristic of the described product of the patent in suit is, that the titer is higher than the melting point of the product as indicated in line 109, page 1, of the specification to

126 line 3, page 2, of the specification (handing witness)?

A. It appears so.

Cross-examination.

By Mr. Alfred M. Allen, attorney for plaintiff:

Counsel for plaintiff offers in evidence the original correspondence with Mr. Kayser referred to in the testimony of the witness, and which was submitted for the inspection of counsel for the defendant, and marks the same "Plaintiff's Exhibit Kayser Correspondence," consisting of three sheets; and same is made part hereof.

X Q. 863. The letters dated October 18, 1907, and November 9, 1907, are in Mr. Kayser's handwriting?

A. Yes; I am familiar with his handwriting, and they are in his handwriting.

X Q. 864. And the other letter dated October 28, 1907, is what?

A. That is letter written by The Procter & Gamble Company and signed by me, addressed to Mr. Kayser, and is the original letter which I signed and sent to Mr. Kayser, and which I obtained again from him.

X Q. 865. Now, Mr. Burchenal, have you a sample here of the kind of material that has been defined by you as "hard stock" and such as was sent to the McCaw Manufacturing Company in 1908?

Objected to by counsel for defendant as secondary.

A. I have.

X Q. 866. Will you please produce it?

A. I offer this sample, similar to the material that was sent
127 to the McCaw Manufacturing Company in 1908 (producing same).

Said sample above produced by the witness is now offered in evidence and marked "Plaintiff's Exhibit Sample Hard Stock," and made part hereof.

Mr. May: The exhibit and the offer is objected to, as secondary evidence.

X Q. 867. Have you any sample of the actual material that was sent to the McCaw Manufacturing Company in 1908?

A. I think I have.

X Q. 868. Can you produce it?

A. I think I can. I think an actual piece of the material is in existence.

Mr. May: The objection, in view of the answer of the witness, is renewed.

The Witness: It is my impression that a piece of the original material sent to the McCaw Manufacturing Company is now in the possession of Mr. McCaw, and can be produced.

X Q. 869. In the report dated March 5, 1908, which is headed, "Result of the last two parallel trials" what does that report refer to?

A. In my opinion this was an experiment to indicate the value

of pressures in saturating fats. It states here that a sample run five hours at ordinary pressure having a melting-point of forty-two degrees, while a sample at sixty pounds' pressure—which was much higher than the ordinary pressure—ran an hour and a half and had a melting-point of forty-three degrees, showing very much greater efficiency in that case between low pressure and high pres-
128 sure.

X Q. 870. What oil is referred to in those two parallel trials?

A. Apparently cotton-seed oil; it states so here.

JOHN J. BURCHENAL.

The further taking of these depositions is now adjourned to Monday, October 9, 1916, at 9:30 A. M.; at which time the taking was resumed, as follows:

CINCINNATI, OHIO, October 9, 1916.

The taking of these depositions was resumed pursuant to adjournment; counsel present as heretofore stated.

Stipulation.

It is stipulated and agreed by and between the plaintiff and the defendant, acting by their respective counsel, that exhibits introduced in evidence on behalf of the plaintiff and of defendant may be retained under the custody of their respective counsel, subject to inspection on demand, and subject to their production at final hearing.

It is further stipulated and agreed that ordinary uncertified printed Patent Office copies of United States and foreign Letters Patent, or photographic or photostatic copies of such Letters Patent, may be introduced in evidence and used with the same force and effect as duly certified copies of the original Letters Patent; subject, however, to correction of errors therein by the production of the original Letters Patent, or certified copies thereof.

129 It is further stipulated and agreed that the dates of filing of the applications for such Letters Patent appearing on such printed or photographic or photostatic copies, may be taken and considered as the true dates of filing of such applications for such Letters Patent.

WALLACE EUGENE MCCAW, a witness produced on behalf of the defendant, having been first duly sworn, deposes and says as follows in answer to interrogatories:

By Mr. May:

Q. 1. Will you please state your full name, age, residence and occupation.

A. Wallace Eugene McCaw; forty-five years old; residence, Cincinnati, Ohio; manufacturer.

Q. 2. Manufacturer of what?

A. Cotton-seed oil and various products produced therefrom.

Q. 3. You were subpœnaed in this case, Mr. McCaw, were you not?

A. Yes, sir.

Q. 4. And are you an employe or officer of The Procter & Gamble Company, the plaintiff in this suit now in hearing?

A. I am an employe of The Procter & Gamble Company.

Q. 5. Are you a director?

A. I am a director of the Company.

Q. 6. And what is your position with the Company?

A. I am President of the Buckeye Cotton-oil Company, a subsidiary company; I am a member of the Executive Committee of The Procter & Gamble Company; I have active charge of the Flake White Department.

130 Q. 7. Flake white is a lard substitute?

A. Lard substitute.

Q. 8. Prior to your connection with The Procter & Gamble Company what was your business?

A. I was engaged in the manufacture of products of cotton-seed.

Q. 9. What was the name of your concern?

A. McCaw Manufacturing Company.

Q. 10. Was it located in Macon, Georgia?

A. At Macon Georgia. I should say that previous to the McCaw Manufacturing Company it was the Georgia Mills and Elevator Company, of Macon, Georgia.

Q. 11. And about January 1st, 1909, the McCaw Manufacturing Company was acquired by The Procter & Gamble Company; is that the fact?

A. Yes, sir; early in 1909.

Q. 12. I think Mr. Burchenal said January 1st?

A. I think it was January 8th; but it was early in the month of January any way.

Q. 13. And prior to the early part of January, 1909, had the McCaw Manufacturing Company been manufacturing lard substitutes, or compounds?

A. Yes.

Q. 14. And will you state the names of the brands or tradenames under which those compounds were sold?

Objected to by counsel for plaintiff, as irrelevant and immaterial.

A. Flake White, Invincible, Planteen.

Q. 15. You had been manufacturing these compounds for some time prior to January, 1909?

Objected to by counsel for plaintiff, as irrelevant and immaterial.

A. Yes.

131 Q. 16. For more than a year certainly?

Objected to by counsel for plaintiff, as irrelevant and immaterial.

A. Yes.
Q. 17. Will you state of what Planteen consisted?
A. It consisted of Oleostearin and Prime Summer Yellow Cotton-Seed Oil.

Mr. Allen: It is understood that counsel for plaintiff objects to all this line of examination connected with the manufacture of lard compounds.

Q. 18. What particular Oleostearin did you use?
A. No particular brand; used the leading brands, I might say.
Q. 19. Beef-stearin?
A. Yes.
Q. 20. And the Beef-stearin was melted and mixed with cotton-seed oil in approximately what proportions?
A. Twenty per cent. of Beef-stearin and eighty per cent. of Prime Summer Yellow Cotton-Seed Oil. Oleostearin is high-grade Beef-stearin.
Q. 21. Now how about Flake White? Was that a mixture or compound of cotton-seed oil and Oleostearin?
A. Flake White is composed of Oleostearin and Prime Summer White Cotton-Seed Oil.
Q. 22. How about Invincible?
A. Invincible was composed of Oleostearin and Prime Summer White Cotton-Seed Oil.
Q. 23. Was there any particular difference between Invincible and Flake White?
A. None.

Mr. Allen: Counsel for plaintiff renews his objection to this line of inquiry.

132 Q. 24. After the acquisition of McCaw Manufacturing Company by The Procter & Gamble Company, under what name was the compound plant carried?
A. I think The Procter & Gamble Manufacturing Company. My recollection is that we carried the McCaw name for a while, that it was "The Procter & Gamble Company, formerly McCaw Manufacturing Company" for a few months, with the idea of shifting from one company to the other.
Q. 25. Prior to May, 1908, did the McCaw Manufacturing Company have business relations with The Procter & Gamble Company?
A. I think we sold them crude cotton-seed oil.
Q. 26. Can you say approximately what was the titer and the melting point of the Oleostearin which you used in the manufacture of the compounds which you have described?

Objected to by counsel for plaintiff, as irrelevant and immaterial.

A. The titer was around fifty-three, as I remember.
Q. 27. Do you remember the melting point?
A. No; we used to buy that in those days on titer test.
Q. 28. It is of record that some time in May, 1908, the Procter &

Gamble Company shipped to the McCaw Manufacturing Company about five hundred pounds of hardened cotton-seed oil; do you recall that shipment?

Objected to by counsel for plaintiff, as irrelevant and immaterial.

A. Yes.

Q. 29. When was that received?

A. To the best of my recollection about the middle of April or May, I don't remember, it has been so long ago.

133 Q. 30. Had you prior to that time had any talk with any one from The Procter & Gamble Company in respect of hardened cotton-seed oil?

A. I had been shown a small sample of the hardened cotton-seed oil the previous February, or March.

Q. 31. By whom was this shown to you?

A. Mr. William Cooper Procter.

Q. 32. Will you explain the circumstances attending his showing you that sample?

A. I knew Mr. Procter very slightly at the time. He came into my New York office one day, and quite hurriedly put down a sample of something that he said was hardened cotton-seed oil. I immediately tasted it, examined its texture, and he asked me if I thought a lard substitute could be made from it, that is, if it would take the place of Oleostearin? I replied that it would not, giving as my reasons that the flavor, structure and material, and its hardness, were all unfit for that purpose. He said, well we might be able to make material of this kind that will be suitable; if so, as a practical lard substitute manufacturer of years' experience, would you conduct some experiments for me to determine the practicability of using it? I replied that I would be glad to do so.

Q. 33. And then what happened after that?

A. Well, I didn't hear anything more from Mr. Procter—well, I would like to correct myself on that—about three or four weeks passed, I thought possibly Mr. Procter knowing me as slightly as he did at the time had either decided to run his own experiments, or to entrust it to somebody else. In my anxiety to know Mr. Procter better, I made an excuse for coming to Cincinnati to see what had become of this material. I was told that they were working on it at Ivorydale, and that it would be along after a while. Another

134 three or four weeks went by, and I made a trip to New York via Cincinnati again to see what was doing. I was told that they hoped to be able to ship in a few days. In about a week after this last trip to Cincinnati I received by express three boxes of the material. Upon examination I could not detect any improvement on the first sample. By the way, my first talk with Mr. Procter took place I think in February, 1908.

Q. 34. How large a shipment of hardened cotton-seed oil was it?

A. There were three boxes. I estimate about one hundred and fifty pounds to the box, I should think, being a total of about four hundred and fifty pounds I should say—though I didn't weigh them, that is a guess.

Q. 35. Was there any acknowledgment by you of this shipment in writing?

A. Not that I recall; sent by express to my home address.

Q. 36. Then what did you do with the hardened cotton-seed oil?

Objected to by counsel for plaintiff as irrelevant and immaterial.

A. I personally overlooked the mixture of this material with Prime Summer White Cotton-Seed Oil.

Q. 37. In what proportions did you mix White Cotton-Seed Oil with the hardened Cotton-Seed Oil?

Objected to by counsel for plaintiff, as irrelevant and immaterial.

A. As well as I remember, we divided the total amount of material into three mixtures, or batches, as you might call them; the
135 first batch was ten per cent. of the hardened material and ninety per cent. cotton-seed oil.

Q. 38. That made a total batch of how much compound?

A. Well, as well as I remember we divided it into three batches, each batch of the three batches being about one thousand pounds of lard substitute.

Q. 39. And the proportions of hardened cotton-seed oil to the cotton-seed oil were about the same in the three batches, except perhaps a variation of one or two per cent?

A. No, it varied from two to four per cent, as far as I can remember.

Q. 40. After you had completed those batches of compound, what did you do with them?

Objected to by counsel for plaintiff, as immaterial and irrelevant.

A. All the three batches were completed about five o'clock in the afternoon, and I set them aside to see how they would look after they had "set," which is the commercial term, as you know.

Q. 41. That was when?

A. Around the 1st of May, 1908.

Q. 42. Then what did you do with those batches of compound after that?

A. Well, the next day, the next morning after the batches were run, an examination showed them to be unmerchantable, and a request was made for further shipments of the hardened material.

Q. 43. What did you do with those batches?

A. Why, they stood around the factory I think for nearly two months, I should say, watching them from day to day to see what the rancidity would be, which was one thing particularly I wanted to watch; and finally they went to what we called in those days
136 our "rancid stock," which was sold to soap manufacturers or to grease buyers.

Q. 44. Why did you consider them unmerchantable when you first saw them the next day?

A. Well, the texture was entirely wrong, it was grainy, lumpy, and the looks of it was horrible, entirely too dark.

Q. 45. Please state exactly how you mixed hardened cotton-seed oil with the cotton-seed oil?

Objected to by counsel for plaintiff, as irrelevant and immaterial.

A. The hardened oil was melted and run into the cotton-seed oil. The batch was then deodorized, then run over the lard rolls.

Q. 46. How did you deodorize the batches?

A. I do not care to answer, as our process is a secret one.

Q. 47. And is still secret?

A. Yes, sir, we guard it jealously.

Q. 48. In other words, you don't allow any one even to-day to know how you deodorize the lard substitutes?

A. Except the people doing it.

Q. 49. Except the people who are employed in that part of the plant?

A. Yes, sir.

Q. 50. Did you try to do anything else with those compounds except deodorizing them?

Objected to by counsel for plaintiff, as irrelevant and immaterial.

A. Well, they were run over the rolls, and these samples that I told you about that we kept for a couple of months, say, or six weeks, were made, that's all I——

137 Q. 51. What was the temperature of the chilling rolls?

A. About five degrees below Zero, temperature of the brine.

Q. 52. That is minus five degrees Fahrenheit?

A. Yes, I meant Fahrenheit, I should have said that.

Q. 53. After running the compound over the rolls, what else happened to the compound?

Objected to by counsel for plaintiff, as irrelevant and immaterial.

A. Nothing, except to draw it into packages to get samples. It went through the picker-box; I never saw a lard roll without a picker-box.

Q. 54. Did you preserve any batches or samples of this material?

A. Only for the six weeks previously mentioned.

Q. 55. And then all that compound was destroyed, or used for making soap?

A. Well, it was sold to either a soap concern, or to people who gather up rancid stuff; it was not fit for shipment; in other words, we would not have dared to ship it.

Q. 56. You would not have dared to ship it as a lard substitute?

A. Yes, that is what I mean, I should have said a lard substitute.

Q. 57. Do you recall to whom you sold it?

A. I don't. We sell to the highest bidder our rancid stuff every few months.

Q. 58. Approximately when was that sold?

A. Well, let us see, May, June—why July or August, I judge.

Q. 59. 1908?

A. 1908, yes. It was not sold in packages, it was all dumped and sold in tierces or barrels with our rancid stuff.

Q. 60. That is to say, it was sold in bulk?

A. Yes. We had to take goods back from time to time that
138 remained out among the trade too long, and exchange them for our regular brands; and we would accumulate several thousand of pounds of this rancid stuff, and then we would write around for bids on it, and it was sold as rancid material—which it was.

Q. 61. What made it turn rancid; was it the cotton-seed oil which made it turn rancid?

A. Too hard for me—I don't know.

Q. 62. It was not the hardened cotton-seed oil that made it turn rancid?

A. I don't know. I would like to say that it was not sold for rancidity alone, it was sold because it was not, in our opinion, an edible product.

Q. 63. Why wasn't it edible? Was it because of the odor?

A. The texture, the appearance, odor and all—badly off.

Q. 64. Didn't you try any of it to see if you could cook with it?

A. Took some home.

Q. 65. Did you cook with it at home?

A. Cooked; but it didn't make an edible product. For instance, I made hot biscuits from it, that is about the most; well, that is a severe test; I would not say most, but it is a good test of an edible product.

Q. 66. It is one of the most severe tests for an edible product, isn't it?

A. I don't know that, I should say that the frying would probably be more severe.

Q. 67. Did you try it by frying something in it?

A. Yes, sir; by frying.

Q. 68. You did fry some food in it?

A. Fried some potato chips, if I remember right.

Q. 69. Did you eat the potato chips?

A. Tasted them, I didn't eat them.

Q. 70. Did anybody else use any of that compound?

A. Not that I know of.

139 Q. 71. They might have, so far as you know?

A. Well, I don't know; I don't see how they did down there at all, because, so far as I know, the samples were not removed from our locker-room where we kept the samples. Somebody may have stolen a sample, so to speak.

Q. 72. Who else beside yourself at the McCaw Manufacturing Company knew about the making of those compounds?

A. Well, my brother did. I trusted him; and some laborers might have known something, although I don't think they had the slightest idea of what was being done.

Q. 73. What is your brother's name?

A. James N. McCaw.

Q. 74. Do you know the names of any of those employes who knew about it?

A. Well they were mostly niggers; no, I would not recall their names. They were just hands around the factory. There was seven or eight hundred of them, you know, there.

Q. 75. Didn't you try some of this compound on any of those darkies, to see whether they could cook with it?

A. I didn't. I had too much respect for them.

Q. 76. Who was the manager of the plant at that time?

A. I was.

Q. 77. Did you have a superintendent?

A. No, I was my own superintendent, I was kind of head waiter, chief cook and bottle-washer—a small plant and my brother and I ran the whole thing practically. Of course we had——

Q. 78. So that there was no one between you and the mill laborers?

A. No, not in the first of this work. It was kept very secret. The hardened material was expressed to my residence in Ivory
140 soap boxes. I merely mention this to show the secrecy that we tried to keep it in. I wired up here—I don't remember whether I wired or wrote, one or the other, not to send it to the factory, and by all means not by freight.

Q. 79. Was the material labeled in any way?

A. It was in Ivory soap boxes. When I came home one night my wife said to me, "Your friend Mr. Procter has sent us three boxes of Ivory soap." I had forgotten about it. I was in hopes he had. I opened it up and found it was not soap, but it came in Ivory soap boxes labelled "Ivory soap."

Q. 80. When was the next time you saw any of this hardened cotton-seed oil?

A. Well, they, The Procter & Gamble Company, I should say it was two or three months more. I got uneasy again, and what they told me now was that they were trying to improve the stuff, and that it took a long time to make very little of it. I know it took a long time all right.

Q. 81. When did you next see any of this hardened compound?

A. Well, I should say it was—it must have ran into September I should think.

Q. 82. Then did you receive another shipment in September of the hardened compound?

A. Yes, my recollection is that they sent us about one thousand pounds, I think it was more than the first shipment, if I remember right.

Q. 83. What did you do with that?

A. Practically repeated the same process, with the exception of our brine and temperature; the speed of the rolls and picker-box was run differently.

Q. 84. Then you mixed a hardened cotton-seed oil with Summer White Cotton-Seed Oil in substantially the same proportions that you had previously done?

A. Substantially the same, yes.

Q. 85. But you changed the temperature of your chilling
141 rolls and changed the speed of the beaters in the picker-box?

A. Yes; and I also had to alter the speed of the rolls.

Q. 86. You also altered the speed of the rolls?

A. Yes.

Q. 87. Then you made approximately how much compound in all?

A. Well, going on the basis that the shipment was one thousand pounds, we made batches of about three thousand pounds each, because approximately ten times as much would be ten thousand, and one-third would be about three thousand pounds in each batch.

Q. 88. What did you do with this compound?

A. Kept it for probably sixty days, and it went the way of the first. Went to the rancid pile, as we call it.

Q. 89. And that was sold in bulk?

A. Sold in bulk that rancid goods, as rancid goods.

Q. 90. That would be some time in October, 1908?

A. Yes, it would be about that time.

Q. 91. Who purchased that, if you remember?

A. I don't know. It was offered to the highest bidder.

Q. 92. Would your record show who purchased that?

A. No, it would not. It might show this—I don't know how complete they have kept the old McCaw records—it might be that we sold several batches of rancid fat along at that time. As to which batch this stuff was in, there would not be any way of telling, because it was dumped, that's all.

Q. 93. You didn't add anything else to those batches of compound other than the hardened cotton seed oil and Summer White Cotton-seed Oil?

A. Not at that time.

Q. 94. Did you preserve any pails or samples of that compound.

142 A. Only for about six weeks or two months, till I was thoroughly satisfied.

Q. 95. You have no samples of either of those batches of compound which you made in May, 1908 and October, 1908?

A. No.

Q. 96. Did you send any samples of those compounds to the Procter & Gamble Company?

A. I sent a sample of the first batch, if I remember. I just suppose I must have sent a second although I don't remember. I think I reported in person on the second without samples. That I am not clear about.

Q. 97. Did you do any cooking with the second compound that you made in October and if so, what did you cook?

A. Cooked potatoes; did some frying; made some biscuits; same thing.

Q. 98. Did you eat any of those products that you cooked?

A. Tasted them, didn't eat them.

Q. 99. Did anybody eat them?

A. Not that I know. I don't think anybody would eat them.

Q. 100. Because of the odor, or taste?

A. Taste and odor. Although both were improved, yet as lard substitutes both were not merchantable.

Q. 101. So that the ordinary method of deodorizing was not sufficient to remove that characteristic odor and taste?

A. Yes, but the odor was too strong.

Q. 102. That is to say, that the ordinary method of deodorizing in use did not remove the characteristic taste or flavor of those compounds?

A. There was something wrong with the goods, so much so that we didn't dare to ship them.

Q. 103. You ran them through your ordinary deodorizing process the ordinary processes that you would use in making compounds?

A. Yes, of oleo lard substitute, just used the same equipment.

143 Q. 104. Do you know whether or not the ordinary methods of deodorizing and chilling lard substitutes are substantially the same as those used in making lard?

A. No, I don't know that; I know very little about the manufacture of hog lard.

Mr. Allen: Counsel for plaintiff wishes to renew his objection to all these above questions, and it is understood that this objection may be taken nunc pro tunc, as incompetent, irrelevant and immaterial.

Q. 105. When did you next see some of the hardened cotton-seed oil?

A. My recollection is that it was early in March, 1909, or late February.

Q. 106. And at that time you received a large shipment of the hardened cotton-seed oil?

A. About March was the first time we received a regular large shipment, car-load lot, as I remember.

Q. 107. What was done with that car-load lot?

A. Well, we were still uneasy about the quality. The Procter & Gamble Company in the meantime had bought the McCaw Manufacturing Company, and they having a great deal more confidence in the edibility of the material than we had, we used it very sparingly, we mixed it with oleostearin, as I remember, we used about one-fourth of the hardened stock and three-fourths oleostearin to make a combined stock that would make the right consistency; and we so labeled our packages, Oleostearin, stearin made from cotton-seed oil, and cotton-seed oil, this labeling having been suggested and agreed upon by the United States Government Meat Inspection Department, the lard substitute plant at Macon at that time being in charge of a government inspector.

144 Q. 108. So that in the compound approximately ten per cent. thereof was made up of oleostearin in the proportions of three parts to one part of the hardened cotton oil, and the balance or ninety per cent. of the compound being made up of cotton-seed oil?

A. Owing to the softness of the oleo it took more than ten per cent. of this one-fourth and three-fourths mixture, as I remember it, to reduced the eighteen or twenty per cent. that we were using down to about twelve per cent., as I remember, of this mixture.

Q. 109. So that this hardened cotton-seed oil served the purpose of hardening the oleostearin so that you didn't have to use so much of the stearin in the compound?

A. That was it. I then made a report on that shipment in person, came up here and told Mr. Procter that we would ship those goods with the understanding that he approved of the shipping of them, as I didn't consider them up to the quality of the brand "Flake White" that we had been marketing for about twelve years up to that time.

Q. 110. Under what brand were they actually shipped and sold?

A. They were shipped under the Flake White brand and the Invincible brand very probably.

Q. 111. And the Planteen also?

A. Not then, no; we didn't disturb the Planteen. By "disturb" I mean that we didn't change the oleostearin.

Q. 112. And you sold this new compound under the same trade name so as to be used in the same way that the previous Flake White and the Invincible had been used?

A. Yes, that was about somewhere around April 1st or late March, 1909.

Q. 113. Did you approach Mr. Procter for the purpose of selling out your business; or did he come to you?

145 Objected to by counsel for plaintiff.

A. Between February or March, 1908, and November, 1908, my acquaintance with Mr. Procter grew owing to the fact that I was trying to make an edible product out of this material mixed with cotton-seed oil, and during that time I learned from him more results of the method that the Procter & Gamble Company was using to hydrogenate cotton-seed oil, but in a very superficial way. I felt that Mr. Procter had taken me into his confidence to a very great extent, and I was most careful not to abuse that confidence. In late November, after the second batches of the material had been made which resulted in his apparently being confident that he could work out eventually an edible product, he told me about that time that the Procter & Gamble Company had decided to go into the lard substitute business, and I replied, "Well, that puts me in a very embarrassing position, do you expect me to let you take my business away from me, or do you expect me to steal your process?"—jokingly; and he replied, "I am not going in the lard substitute business without you." I said, "Well, you understand that that means the purchase of my plant, as I will not leave my people;" and I referred him to my largest stockholders, and negotiations were started. On December 24, 1908, I had the first really definite talk about price and figures. That was in Cincinnati. I took the matter up on December 27, 1908, with my principal stockholders; and as well as I recollect it, about January 9th, we agreed on the price.

Q. 114. And then the transfer was made?

A. Yes.

Q. 115. He considered you as a very valuable man so far
146 as you know to him to work out the proper processes of deodorizing and treating those compounds?

A. Well, I think he really looked more to my commercial ability possibly than he did the manufacturing. The Procter & Gamble Company had so many years of experience in fats—of course it was up to that time all inedible fats, soap fats; but at the same time I think they felt pretty confident that they knew the fat game, so to speak, because he was very insistent that he could work this product out, and I with my experience which at that time had been something like fourteen years' experience that I was in that business—he was so strong on it that he bought the plant before we had ever solved the problem. That showed his confidence.

Q. 116. It required considerable experimentation in order to work out a proper process of deodorizing compounds in order to make those compounds?

Objected to by counsel for plaintiff as irrelevant and immaterial.

A. Well, in following out the perfecting of the product, so to speak, I really had practically nothing to do with it, whereas their chemist and laboratory at Ivorydale worked it out up here. We simply did the mixing, as you might say, down there; but the real trick was done here and I had no connection with it; and that is the reason I think he considered my commercial value to the company—I had been marketing a lard substitute at that time for fourteen years.

Q. 117. It is quite a trick to treat this material so as to get an edible compound?

Objected to by counsel for plaintiff as immaterial and irrelevant.

147 A. So far as my knowledge goes, it is. I have been led to believe that,—have been told that. It certainly took time to do it, and we lost certainly a quarter of a million dollars in the time it took, if they could have done it without any trouble.

Q. 118. It cost about a quarter of a million dollars to find out how to make this hardened compound so that it would be commercially edible?

A. Possibly cost a great deal more. I am only speaking of the time on that second batch that we had to use oleo which at that season was very high, as I recollect it fifteen or sixteen, probably eighteen cents, instead of this hardened material. If they had known how to do it—I don't understand why they should not have done it and made that difference; and their attention was called to that loss repeatedly, and the difference in cost.

Q. 119. You said something about the meat inspector or inspector from the Department of Agriculture; such inspector had been at your plant inspecting the beef stearin, or your compound made therefrom, previous to 1908?

Counsel for plaintiff objects on same grounds, and further, be-

cause the Court has distinctly ruled out an interrogatory on this point.

A. As I remember the date, it was June 30, 1906, that the government made effective a law requiring an inspector at each plant that manufactured a meat food product for interstate shipments, and lard substitute made from oleostearin and cotton-seed oil was considered under that law a meat food product.

Q. 120. Did you show this inspector any of the compound that you made in 1908?

148 Same objection by counsel for plaintiff.

A. No, sir.

Q. 121. Do you recall the name of the inspector?

Same objection by counsel for plaintiff.

A. His name was Flory. I don't remember his initials.

Q. 122. When did he leave the plant?

Same objection by counsel for plaintiff.

A. The best of my recollection is that he left there in June, 1911.

Q. 123. That was about the time when you stopped using oleostearin in the compound containing cotton-seed oil and hardened cotton-seed oil?

A. Yes, sir; when we discontinued the use of the oleostearin, we discontinued the inspector.

Q. 124. And up to that time, in all those lard substitutes or lard compounds that you manufactured and sold containing the hardened cotton-seed oil you had also included animal oleostearin?

A. Yes, up to the time the inspector left.

Q. 125. By that time you had succeeded in finding a way to remove the unpalatable taste and the unpleasant odor of the compound?

A. We felt safe in making a lard substitute composed of hydrogenated oil and cotton-seed oil.

Q. 126. That is one of your secret processes, I believe; that is, the method of getting rid of the flavor and the taste is one of your secret processes?

A. Yes, sir.

Q. 127. That is something you never tell any one not connected with the works?

A. Not to my knowledge has any one ever been told.

149 Q. 128. When that hardened cotton-seed oil was sent to you in 1908 did you make any test of it to ascertain as to the nickel which it contained?

A. No; we knew nothing about nickel at that time.

Q. 129. That never gave you any bother—the nickel?

A. We didn't know what gave us—I didn't know what gave us the bother, I just knew the stuff was inedible and unsalable as a food product.

Q. 130. Subsequently to that time, in the manufacture of the

product containing hardened cottonseed oil did you have any difficulty due to the presence of nickel in the hardened cotton-seed oil?

A. I knew nothing about nickel.

Q. 131. So far as you know, the presence of the nickel was never objected to?

A. At that time I knew nothing about the nickel, I didn't know how they were hydrogenating the oil, I didn't know how they did it.

Q. 132. Was that subsequently objected to; that is to say, contained nickel?

A. I don't recall any commercial objection.

Q. 133. Were there any other objections other than commercial?

A. None that I know of. I have heard nickel talked more or less in a general way since I moved up here; but I really know nothing about it.

Q. 134. Do you know whether a considerable effort was made to find some way of removing the nickel so far as possible?

A. No; Mr. Burchenal has all that in charge; I don't know anything about that.

Q. 135. I gathered from what he said that you were more familiar than he with the details relating to the manufacture of products containing hydrogenated cotton-seed oil?

A. Lard substitute? I think he expressed it very well when he said "details." I am with the details, but I would not regard the nickel proposition as a detail, I would regard that as a chemical proposition, and I am not a chemist—not an expert.

Q. 136. So th[illegible] ou don't know whether they were put to it to find some way of [illegible]tting out the nickel in the hardened cotton-seed oil?

A. I don't know that positively, it is only hearsay.

Q. 137. But you heard more or less talk?

A. I have heard more or less talk about nickel from everybody who worked at hydrogenating oil, but only in a general way do I know anything about it.

Q. 138. Who would know about that more in The Procter & Gamble Company?

A. Well, that would come I [illegible]uld judge under Mr. Burchenal's direction—not that he himself [illegible]ight know, but——

Q. 139. Does Mr. A. E. Anderson know about that?

A. I should think so. He was Mr. Burchenal's right-hand man in a way, I mean the General Superintendent of our plant. I really don't know how that chemical work is divided into details, I don't know whether that goes direct to the chemical laboratory without Mr. Anderson knowing it, or whether it would go there through him.

Q. 140. Who had charge of the chemical laboratory during this period we were talking about in 1911?

A. In Ivorydale? I really don't know.

Q. 141. You kept charge of that plant at Macon, Georgia, for quite a long time, I believe?

A. From the date of the sale early in January, 1909, up to the

first day of May, 1910, which is when I moved up here and turned the plant over to others.

Q. 142. I suppose you went down there occasionally so as to keep in touch with the products?

A. Oh, I still do—I still do.

151 Q. 143. I heard—I don't know how much truth there is in it—that you went to Washington to confer with the officials of the Department of Agriculture about these compounds containing hydrogenated cotton-seed oil; is that true, did you go?

Objected to by counsel for plaintiff, as irrelevant and immaterial.

A. Yes.

Q. 144. When was that?

A. I should say that that was not until November or December, 1909, or probably the spring of 1910.

Q. 145. Had the Inspector at the plant, Mr. Flory, sent in samples of the hardened cotton-seed oil, or the compound, to the Department before that time?

Objected to by counsel for plaintiff, as before.

A. Not to my knowledge he hadn't, but I judge so, Mr. May, because he sent samples of all goods right along, I mean not every day, but quite frequently.

Q. 146. How did you happen to go up to see them at Washington?

Counsel for plaintiff objects, on same grounds, to all of this line of questioning.

A. I wanted to know how the Government wanted us to brand our goods carrying hydrogenated oil and oleo and cotton-seed oil, what brand would they suggest, that is, should we show the hydrogenated oil as an ingredient, so to speak, or if it would be satisfactory to them to continue to use the old labels? If I remember

152 correctly, it must have been the spring of 1910 that we were becoming more and more, after a two years' trial, efficient in using this hydrogenated material, in short, we were cutting down the oleo and its becoming a factor in the goods. I didn't want to get in trouble with the Government. I went down there and showed my hand plainly and had a frank talk. I think the Government suggested that we say: "Stearin Made from Cotton-seed Oil." Never mind, it was the final outcome of an hour or so's talk over the matter that we do that, whoever suggested it, and the labels were made to read that way.

Q. 147. The Government had no objection to your using cotton-seed oil stearin in place of oleostearin?

Objected to by counsel for plaintiff, on same grounds.

A. None that they ever told me. They said they were going to look into it. I don't know how far they did or what they did; but the inference was if I didn't hear any objection that it would be all right, and so far as I recall it never was objected to.

Q. 148. They issued an order some time, didn't they, to compound makers in regard to the use of these hardened cotton-seed products?

Objected to by counsel for plaintiff, on same grounds.

A. I heard they did. I don't remember, however, receiving it. We had been in such close touch with them about it I guess they thought it was unnecessary to send us one—although they might have sent it, but I don't recall that we ever received it.

Q. 149. You didn't yourself try to hydrogenate any oil, did you?

A. No, not personally, no.

153 Q. 150. I mean to say, down at Macon, Georgia, did you ever try to make any of the hardened cotton oil before you made your trade with Procter & Gamble?

A. No, sir.

Q. 151. You don't know, then, whether or not that circular letter was sent out sometime about April 28, 1909, and numbered 388Z-Y?

A. No, I have no recollection of ever seeing that circular.

Q. 152. You had the good fortune to make a trip to Europe in 1909, didn't you?

A. If that is the way to express it, fortunate, I made one, yes, in 1909, during the summer.

Q. 153. What was the occasion of your going—pleasure trip?

A. Combination.

Q. 154. Combination — business and pleasure.

A. All my trips are that; I have not had a real strictly pleasure one in fourteen years.

Q. 155. And part of the business and of that trip was to see Messrs. Crossfield & Sons, Limited?

A. Yes, sir.

Q. 156. In fact, that was really the occasion of your trip to England at that time, to see Messrs. Crossfield & Sons, Limited?

A. That was the principal object of my trip.

Q. 157. You went at Mr. William Cooper Procter's suggestion?

A. Yes, sir.

Q. 158. And it was a rather unexpected trip when you went off?

A. Yes; I had only been with the Company a few months, I was rather surprised that they trusted me in a way, my being a new man.

Q. 159. It was a pretty big thing to entrust to practically a new man in the concern, I take it?

A. Well, I don't know how big it was, I was not told very much about it; I was told what to do, and I went over and did it, but as to its value I really didn't know at the time. I knew very little of the importance of the trip at the time.

154 Q. 160. Mr. Procter told you that they had had a man working for them who had previously been with Crossfield & Sons, Limited?

A. Unfortunately, he didn't.

Q. 161. He didn't tell you that?

A. No.

Q. 162. Were you sent over to purchase whatever rights the Crossfield concern had in the United States?

A. I was told to do this, that the Crossfields had—and that was the

first time I had ever heard of it—that they had some patent rights that he wanted to obtain as they would strengthen his patent rights would make our rights stronger if we obtained the Crossfield patent rights.

Q. 163. And the Crossfields thought that they had some kind of a claim over here because of the fact that one of their men had come over to The Procter & Gamble Company and brought their process along with them?

A. That I don't know; but at my first interview with the Crossfields they asked me if I knew a man named Kayser? I said, Yes, I had heard of him, but had never seen him. They replied to that, stated that he had come from their plant——

Q. 164. And swiped their processes?

A. And they seemed quite put out about it. They didn't say that he had swiped the process, but they seemed to be put out about Kayser being with us when they asked me if we had him with us.

Q. 165. Previous to that time do you know whether or not the Crossfields had been trying to sell their rights over here to other concerns?

A. I had heard of that, yes, a few days before I sailed I heard that one of the Crossfields was over here trying to sell rights.

Q. 166. So your job was to get those rights before anybody else did?

A. Whatever rights there were I was supposed to secure in
155 order to strengthen what I was told at the time were our rights.

Q. 167. So you did in point of fact make a trade with Mr. Crossfield and paid him quite a large amount of money—I am not going to ask you how much?

A. I was just smiling about the large amount; because it looked large to me then, and now I don't know whether it looks large or not—different view-point.

Q. 168. Somewhere in the six figures?

A. Well, it was a substantial sum.

Q. 169. When you actually put the labels on the compounds that you made containing the hardened cotton-seed oil, how was the label actually written, do you remember?

A. "Flake White, Composed of Oleostearin, Stearin Made from Cotton-seed Oil, and Cotton-seed Oil, Manufactured by The Procter & Gamble Company, Macon, Ga., Establishment No."—631, I think. I don't know just as to that.

Q. 170. I was under the impression that the statement of the ingredients read substantially as follows: "Cotton-seed Oil, Cotton Oil Stearin, Oleostearin"; is that correct?

A. No; I feel quite sure it was "Stearin Made from Cotton-seed Oil"—very positive about that.

Q. 171. You don't happen to have any of those old labels, do you?

A. I shouldn't think so; it has been several years back.

Q. 172. Would you mind looking to see if you can find one of those old labels, and if so let Mr. Anderson have it so that he can produce it for you, because I want to let you get off the witness-stand as soon as possible?

A. Yes; if he can find one.

Q. 173. You said that when the Inspector left the plant at Macon, Georgia, that was because they stopped using oleostearin in
156 the compound, was it?

A. Yes, sir, that is my recollection.

Q. 174. Now going back once more to the potato chips and biscuits that you tried out, I suppose they would have been all right if it hadn't been for the taste and odor given them by the compound that you used?

A. Well, not only taste and odor, but I remember one very prominent objection which did not involve taste or odor, and that was in the early stages we could not heat the food to a high enough temperature simply in frying now, not the biscuit, to make the potato chips crisp; they were soggy.

Q. 175. But in the biscuits the sole objection that arose was from the taste?

A. Taste and the odor, those two things.

Q. 176. That was all?

A. Well, they were inclined toward sogginess, but it didn't show, of course, as marked as in frying.

Q. 177. I suppose as a matter of fact the sogginess would have been decreased by using a smaller proportion of the compound in making up the dough?

A. Well, I would not admit that, because I have done so much of that kind of work that I don't believe I used too much of the dough; I made several batches of it, and reduced the quantity so in one batch that I had so little shortening that the biscuits were not shortened enough.

Q. 178. Is it the cotton-seed oil that makes the biscuits soggy?

A. In that product I don't know what was the matter with that product.

Q. 179. It would not be hardened stearin?

A. Of course we felt it was hardened stearin, because we had used cotton-seed oil fourteen years before we heard of it. I had made biscuits before and didn't have any trouble. Then we were naturally suspicious of a new article, and if anything went wrong
157 we naturally blamed it on it and felt positive that that was the trouble due to the fact that we had done so much experimenting with cotton-seed oil for a few years.

Q. 180. As a matter of fact cotton oil had been used very largely alone in cooking?

A. Not at that time; I would not say largely; compared to the amount of oil that is consumed for table products in these days what we call cooking oil, the consumption of it was quite small, I mean comparatively speaking.

Q. 181. It was quite an appreciable amount taking it altogether?

A. Certainly not compared to the present consumption.

Q. 182. Of course that is so to-day, cotton-seed oil is used in very large quantities for cooking purposes without the addition of cotton-seed stearin or oleostearin?

A. Yes.

Q. 183. It is also used as a table oil?

A. In a limited way—quite limited.

Q. 184. Do you know whether or not cotton-seed stearin is used or has been used as a cooking fat?

A. Not to my knowledge.

Q. 185. I took it when you used this hardened cotton-seed oil and figured that it might replace oleostearin you saw that there was the secret, that the primary consideration was saving in cost?

A. That was the first, yes, primary, the cost.

Q. 186. After the Procter & Gamble Company had built their plant at Ivorydale for making hydrogenated products or lard substitutes, you had charge for six months or a year?

A. Yes; but had nothing to do with the hydrogenization of the fat. It was turned over to me hydrogenated; if I thought it was not done right I had a right to complain. I handled that
158 along the same lines as the Macon, Georgia, plant, after it was first bought.

Q. 187. So that while you didn't actually oversee the process of hydrogenization, you had charge of the production of the lard substitute?

A. Of the lard substitute made from the hydrogenated fat and the cotton-seed oil.

Mr. Allen. Counsel for plaintiff wishes again to renew his objection to the examination of Mr. McCaw and to all inquiries connected with the manufacture of the lard substitute out of hardened hydrogenated cotton-seed oil; and it is understood that this objection applies to all the questions whether objections were made at the time, or not.

Mr. May: I have no objection to that statement.

Cross-examination.

By Mr. Alfred M. Allen, attorney for plaintiff:

X Q. 188. You spoke in your direct examination about a possible loss of two hundred and fifty thousand dollars during the experimental time that you have mentioned; just what did you mean by that?

A. I mean that during the period between the time the experimental batches were run in Macon, Georgia, and the time that we were given hydrogenated oil of such quality that we could produce an edible commercial product, that the loss in my opinion was easily two hundred and fifty thousand dollars due to the difference
159 in what the hydrogenated oil cost would have cost to produce of edible quality and the price we had to pay for the oleostearin that was consumed during this period.

Redirect examination.

By Mr. M. B. May, attorney for defendant.

R. D. Q. 189. After the Procter & Gamble Company found out how to produce the hardened cotton-seed oil so that it could be used for making an edible product, the way in which they have treated the materials to do this has always been kept a secret?

A. So far as I know.

R. D. Q. 190. And the Procter & Gamble Company have since continued to sell the compounds, Planteen, Flake White and Invincible, under the same name under which they were sold by you prior to the acquisition of your business by The Procter & Gamble Company?

A. Those three brands have been continued, yes.

R. D. Q. 191. And there has not been any objection on the part of the users of those brands to the compounds?

A. None that I have heard of

R. D. Q. 192. They would just as soon have one as the ot'er, the old compounds or the new compounds?

A. So far as my knowledge goes.

R. D. Q. 193. It doesn't make an difference at all?

A. So far as my knowledge goes.

R. D. Q. 194. You would be likely to know if there were?

A. I should think so.

R. D. Q. 195. In other words that is part of your business to know?

A Yes.

WALLACE E. McCAW.

The further taking of these depositions is now adjourned to Tuesday, ctober 10, 1916, at 9:30 A. M.

160 Tuesday Morning, October 10, 1916.

The taking of these depositions was resumed pursuant to adjournment, counsel present as heretofore noted.

Thereupon ALBERT EDWARD ANDERSON, a witness produced in behalf of the defendant, having been first duly sworn, deposes and says as follows, in answer to interrogatories:

By Mr. May:

Q. 1. Please state your name, age, residence and occupation?

A. Albert Edward Anderson; age, forty-four, residence, Glendale; Superintendent Procter & Gamble Company.

Q. 2. Of what particular plant, or portion of the plant of the Procter & Gamble Company are you superintendent?

A. Why, I have direct jurisdiction over all of the Ivorydale plant, and indirect supervision, through the superintendents, of the other plants at Port Ivory, Kansas City, Hamilton, Ontario, and Macon, Georgia.

Q. 3. So that you have charge of all the work that goes on?
A. All of the manufacturing.
Q. 4. In the various plants of the Procter & Gamble Company?
A. Yes.
Q. 5. How long have you held that position?
A. I don't know exactly; about ten or twelve years.
Q. 6. You were subpœnaed by the defendant to appear and testify in this case, were you not?
A. Yes.
Q. 7. It is of record in this case that Mr. E. C. Kayser, formerly residing in England, came to this country in the last of No-
161 vember, 1907, and that early in January, 1908, a small plant for the hydrogenation of oils was built by, or for him, at the Ivorydale factory of The Procter & Gamble Company; you are familiar with that circumstance, are you not?
A. Yes.
Q. 8. And are you familiar with the apparatus which he used at that time in the hardening of oils?
A. Yes.

Mr. Allen: This is objected to as irrelevant and immaterial.

Q. 9. What apparatus was included in that small plant, Mr. Anderson?

Mr. Allen: Tha tis objected to as irrelevant and immaterial.

A. Am I supposed to answer?

Mr. Allen: Oh, yes.

A. There was apparatus for producing hydrogen gas, apparatus for making catalyzer, and apparatus for hydrogenating oil.
Q. 10. Without going into detail as to the method of producing the catalyzer,—the catalyzer itself consisted of finely divided kieselguhr with nickel chemically deposited thereon?
A. Yes.
Q. 11. Did the original plant include apparatus for the production of hydrogen, or did you purchase the hydrogen in flasks or containers?
A. We purchased some of it, and we made some of it.
Q. 12. How was the hydrogen made?
A. Zinc and acid.
Q. 13. Will you please describe accurately the apparatus which was used by Mr. Kayser for hardening or hydrogenizing oils?

162 The same objection as heretofore noted is entered by Mr. Allen.

A. A closed cylinder of copper, with internal agitator, with an inlet and outlet for the hydrogen gas.
Q. 14. What were the dimensions of this container?
A. Approximately ten to twelve inches in diameter, and eighteen to twenty-four inches long.
Q. 15. Were drawings of this apparatus made?
A. No.

Q. 16. From what was the apparatus itself produced, from sketches or drawings?

A. From rough pencil sketches by Mr. Kayser and his verbal description of it, of what he wanted.

Q. 17. So that the container was a copper cylinder from twenty to twenty-four inches in length?

A. Eighteen to twenty inches.

Q. 18. Eighteen to twenty inches?

A. I am only guessing at that length, you understand.

Q. 19. What was the diameter?

A. Ten to twelve inches.

Q. 20. Ten to twelve inches in diameter?

A. Yes.

Q. 21. Did a shaft extend longitudinally through the cylinder?

A. Yes.

Mr. Allen: To save making an objection to each separate question in regard to the apparatus and the method pursued by Mr. Kayser, counsel for plaintiff wishes to enter objection once for all to such inquiries, as irrelevant and immaterial. It is understood that this objection is to apply to all such inquiries.

Q. 22. Was anything mounted on this shaft inside of the cylinder?

A. Yes; an agitator.

163 Q. 23. Please describe that agitator?

A. A series of arms upon which were woven or attached sheets of wire cloth.

Q. 24. Of what metal was the wire cloth made?

A. Brass.

Q. 25. About what mesh?

A. Why, I don't know; I would say twenty to forty mesh—fine wire cloth.

Q. 26. Was there any provision made for the introduction of the oil into this cylinder?

A. An opening at the top; the oil was poured into it through a funnel.

Q. 27. It was a closed opening with a cap?

A. A plug was used.

Q. 28. How was it plugged?

A. Just an ordinary plug that screws into a coupling.

Q. 29. Then the opening was closed by a screw plug?

A. Yes.

Q. 30. Is that apparatus still in existence?

A. I don't know.

Q. 31. When was the last time you saw it?

A. Oh, I haven't seen it for more than a year.

Q. 32. Who would know whether or not it is in existence?

A. I don't know of anyone.

Q. 33. Was that apparatus destroyed?

A. I don't know. It might have been sold as scrap copper; it has not been used recently at all. About a year ago we collected all

the scrap copper around the place—caused all the scrap copper around the place to be collected and sold, and this may have been amongst it.

Q. 34. In order that it may appear of record just how that apparatus was constructed, I will ask you to look at Figure One of the drawing of the Kayser Patent #1,004,035, and state if that drawing illustrates substantially correctly the apparatus which you have just described?

A. (After examination of patent) Yes; it is similar to that.

164 Q. 35. I note that in this drawing which you have just examined, the apparatus is provided with a draw-off cock marked "F;" did Mr. Kayser's have that, or an equivalent device for drawing off the oil from the cylinder?

A. I think it did, but not in that location.

Q. 36. Just where was the draw-off cock located?

A. On the end.

Q. 37. So that the material was drawn off through the end of the cylinder instead of through the side?

A. Yes.

Q. 38. Will you look at Figures 2 and 3 of the drawing of Patent No. 1,004,035, and state whether those figures illustrate approximately correctly the agitator which Mr. Kayser used in that apparatus? I may say for your information that Figure 3 purports to be a transverse section on the line 3-3 of Figure 1, and that Figure 2 purports to be a section on the line 2-2 of Figure 1.

A. I think not.

Q. 39. In what respect did the agitator which Mr. Kayser used differ from the agitator shown there?

A. I think the *vains* were attached separately, one from the other.

Q. 40. That is to say, instead of having a continuous sheet that was wound over and under the rods, the *vains* each consisted of a separate or single sheet?

A. Yes.

Q. 41. Of the wire cloth?

A. Yes.

Q. 42. What means were utilized to rotate the shaft which carried the agitator paddles?

A. Driven from a shaft above.

Q. 43. By means of a belt and pulleys?

A. By means of a belt and pulleys.

Q. 44. Do you remember the speed of the rotation of the shaft?

A. I do not.

Q. 45. Was it approximately one hundred revolutions per minute?

A. At least that.

165 Q. 46. Was it any faster than that?

A. If I were to guess, I should say it was.

Q. 47. Mr. Burchenal produced the reports that were made by you, or Mr. Kayser, during the year 1908, and I will ask you to look at the notes entitled, "Demonstration by E. C. Kayser of the process for hardening fats, January, 1908. Notes by A. E. Anderson," and to state whether or not you prepared those notes?

A. (After examining) I was responsible for that.

Q. 48. That is, these notes were prepared regularly by you, or under your direction?

A. Yes.

Q. 49. I notice that in the description of treatment of the fat, the wire gauze agitator is described as "revolving at about 100 R. P. M.;" what did you mean by "100 R. P. M."?

A. 100 revolutions per minute.

Q. 50. How was the cylinder heated during the process of hydrogenation?

A. Gas flame.

Q. 51. A single gas flame?

A. What do you mean by "a single gas flame?"

Q. 52. What I mean by it is, was there a perforated pipe extending lengthwise of the cylinder and placed underneath it, provided with a line or lines of apertures for the emission of the gas, so that there were a number of small flames; or, on the other hand, did you use only a single flame jet for heating the contents of the cylinder?

A. A long perforated pipe, substantially as you have described.

Q. 53. In the first part of my question?

A. Yes.

Q. 54. Were the notes on pages E-5, E-6, E-9, E-11 and E-12, all prepared by you, or under your directions?

A. (After examining) Yes.

Q. 55. In carrying on the hardening process with the Kay-
166 ser apparatus, approximately what was the depth of the liquid in the cylinder container?

A. My recollection is that it was about one-half full.

Q. 56. That is to say, in Figure 1 of the Kayser Patent No. 1,004,035, the depth of the oil as used by Mr. Kayser was about up to the level of the shaft?

A. Yes.

Mr. May: I offer in evidence a copy of United States Letters Patent, to E. C. Kayser, No. 1,004,035, dated September 26, 1911, and ask that the same be marked, "Defendant's Exhibit No. 1, copy of Kayser Patent No. 1,004,035," together with this date and the initials of the Special Examiner.

The said document is so marked.

Q. 57. Was the cylinder as first used by Mr. Kayser provided with an enclosing jacket?

A. No.

Q. 58. Was it subsequently provided with a jacket?

A. No.

Q. 59. For containing steam?

A. For containing what?

Q. 60. For containing steam, or other heating medium?

A. You mean a jacket around the shell?

Q. 61. Yes?

A. No.

Q. 62. How was the temperature of the oil in the container ascertained?

A. By a thermometer.

Q. 63. Was the container provided with a thermometer well?

A. What do you mean, what do you call a thermometer well?

Q. 64. I mean was there provision for introducing the thermometer into the oil in the container for determining its temperature?

A. Yes.

Q. 65. Was there any means provided for ascertaining
167 the pressure of hydrogen in the container, as used by Mr. Kayser?

A. Not at the beginning. Later there was.

Q. 66. How much later?

A. Oh, a month or two, I guess after he began.

Q. 67. But during the——

A. —during the preliminary work there was.

Q. 68. What oils were hydrogenized or treated by Mr. Kayser with this apparatus prior to, say, November, 1908?

A. Cotton-seed oil, tallow—that's all I have any recollection of.

Q. 69. And various grades of cotton-seed oil were treated in this apparatus?

A. All refined oils.

Q. 70. Different refined oils?

A. Differing in what way?

Q. 71. Is there any difference in refined cotton-seed oils?

A. Not in refined oils alone. After refining you can make it white, bleach it, but it is still refined oil.

Q. 72. I was under the impression that refined oil was graded, for instance, as Summer Yellow Oil, Summer White Oil, Winter White Oil, and so forth; isn't that so?

A. Why, refined oil is graded into several grades, but they are all refined oil. After they are refined they can be bleached, some of them, and made into white oil, and by another treatment they can be made into Winter Oil, as Winter Oil is different from refined cotton-seed oil, in that it undergoes another treatment.

Q. 73. But they are all refined oil?

A. All refined oil.

Q. 74. Did Mr. Kayser treat these various grades of refined oil?

A. My recollection is that he treated only refined Yellow oil and perhaps some White Oil; I don't know; I don't recall that.

Q. 75. What was approximately the capacity of the con-
168 tainer which Mr. Kayser used for hydrogenizing oil?

A. It was designed for twenty pounds.

Q. 76. But more than that could be put into it and treated?

A. I don't know, because I don't think we ever attempted to put more; we thought it was better to use less, rather than more.

Q. 77. So as to get a greater volume of hydrogen in the container?

A. Yes.

Q. 78. Sometimes the total charge, including the oil and the catalyzer amounted to as much as twenty-four pounds?

A. I don't recall; I have not seen those notes there—I haven't looked at those since they were made.

Q. 79. After making that small plant, did Mr. Kayser thereafter make or cause to be made a larger plant for the hydrogenation of oil?

A. Yes.

Q. 80. When was that?

A. Well, we must have been working on that together for six months; it was completed in February, 1909. I don't know when we began.

Q. 81. What was the capacity of that plant?

A. We designed that for 3,000 pounds.

Q. 82. So that between the construction by Mr. Kayser of that first small apparatus, and the erection of that larger plant, there was no smaller piece of apparatus produced by, or for, Mr. Kayser for the hydrogenizing of oil?

A. No.

Q. 83. And until the operation of that large plant in February, 1909, all of the hardened fat which was produced by Mr. Kayser was produced by the aid of that small hydrogenizing apparatus which was made in January, 1908?

A. Yes.

Q. 84. Except for its size, did the hydrogenizing container which you had in February, 1909, differ from the previous small hydrogenator?

A. Yes.

Q. 85. In what respect?

A. In the method of heating.

169 Q. 86. Is that all?

A. I think so.

Q. 87. How was the hydrogenator heated in the second apparatus?

A. Steam jacket.

Q. 88. Substantially as shown in Figure 1 of the Kayser patent No. 1,008,474?

A. (After examining) Yes.

Mr. May: I offer in evidence in behalf of the defendant a copy of United States Letters Patent to E. C. Kayser, No. 1,008,474, dated November 14, 1911, and ask that the same be marked "Defendant's Exhibit No. 2, Kayser Patent No. 1,008,474," together with this date and the initials of the Special Examiner.

The said document is so marked.

Q. 89. Was that second hydrogenator substantially as shown in Figures 1 and 2 of the Defendant's Exhibit No. 2?

A. (After examining) Yes.

Q. 90. When you built this second plant, what did it comprise?

A. The equivalent of the first plant on an enlarged scale.

Q. 91. Well, specifically, please state?

A. Apparatus for the production of hydrogen gas, apparatus for

the manufacture of catalyzer, and apparatus for the hydrogenation of oil.

Q. 92. How many hydrogenizers were included in that first plant?

A. My recollection is there were three.

Q. 93. Each capable of holding about how much material?

A. Three thousand pounds they were designed for.

Q. 94. So that the hydrogenating apparatus as a whole was capable of hydrogenizing about nine thousand pounds of oil?

A. Yes.

170 Q. 95. In the production of the hardened oil, what was the proportion by weight of catalyzer to the oil?

A. My recollection is that it was about one per cent.

Q. 96. Not one per cent. of nickel necessarily, but one per cent of nickel and kieselguhr?

A. One per cent. of nickel, to begin with.

Q. 97. What was the proportion of nickel by weight to the kieselguhr?

A. I don't recall; I haven't that formula in my mind.

Q. 98. Would it assist you to look at this note on page E–5, which is dated as of January 17, 1908?

A. (After examining) It is my recollection that we followed these proportions during the early stages of the operation of the larger plant.

Q. 99. That is to say, you used about one per cent. of nickel metal and two per cent. of kieselguhr?

A. Yes—now I have not read those notes since—they were spirited away from me before I had a chance to read them, so that when you are asking about this, I haven't read those for five years.

Q. 100. These notes were true, however, at the time you made them?

A. Oh, absolutely.

Q. 101. During the use of the small hydrogenator, did you vary the speed of rotation of the agitator?

A. Most likely there were experiments made at different speeds.

Q. 102. Did you observe what effect the variation in the speed of the rotator had upon the product drawn from the apparatus?

A. If it is noted there—I haven't any recollection what the result was.

Q. 103. I would like to have you just read over these notes, if you please, and refresh your recollection as well as you may from those notes.

A. (After reading notes) Well, I replied as I did because I

171 am quite sure that we did not develop this without some experiment as to the speed of that agitator. I have no recollection of tests along that line, or the results of those tests.

Q. 104. Have you since ascertained whether or not a variation in the speed of rotation of the agitator has any effect upon the resultant product, or upon the reaction which takes place in the hydrogenator?

A. We have made experiments and decided upon what we consider the best speed.

Q. 105. What do you consider the best speed?

A. It depends entirely upon the size and type of the machine.

Q. 106. Does a variation in the speed of rotation of the agitator have any effect other than speeding the reaction?

A. Yes.

Q. 107. What other effect does it have?

A. It speeds the wear out of the agitator.

Q. 108. And that is all, is it?

A. Yes.

Q. 109. In hydrogenating or treating oils with the Kayser hydrogenator, you tried different pressures of hydrogen in the containers, did you not?

A. Yes.

Q. 110. Did you ascertain whether or not there was any variation in the reaction, or in the product, due to variations in pressures?

A. Yes.

Q. 111. What results did you note resulted from the variation in the pressure?

A. We did not work along that line very exhaustively; but we did determine to our satisfaction that the process was—the reaction was faster under pressure, but at the same time the leakage was greater, and we did not for that reason, in that apparatus, attempt to work along lines of high pressure.

Q. 112. What did you find to be the optimum pressure?

A. Sixty pounds or under, in a large way.

Q. 113. That is to say, you found——

A. —sixty pounds maximum.

172 Q. 114. What minimum pressure?

A. Atmospheric.

Q. 115. So that an optimum pressure would be one ranging from atmospheric pressure to si· · pounds pressure?

A. Yes.

Q. 116. Did you not find the speed or reaction was greatly increased by an increase in pressure?

A. No; not greatly.

Q. 117. Well, materially?

A. Yes.

Q. 118. Have you, up to the present time, noted whether or not there is any variation in the product resulting from a catalytic hydrogenation of oil due to variation in the pressure?

A. No.

Q. 119. It is of record in this case that some of the product which was produced by Mr. Kayser was shipped to Macon, Georgia, in the Spring of 1908; are you familiar with that fact?

A. Yes.

Mr. Allen: Counsel for the plaintiff objects to this question, and to all questions relating to what was done with the product sent to Macon, Georgia, as irrelevant and immaterial, and it is understood that this objection shall be considered as made to all questions or investigation along this line.

Q. 120. Can you state when the first shipment of this treated oil was sent?

A. To Macon?

Q. 121. Yes?

A. In May, 1908.

Q. 122. When did the next shipment of hardened oil to Macon occur?

A. I don't know definitely, but I think it must have been after the operation of the larger plant, in February or March, 1909.

Q. 123. Mr. McCaw stated yesterday during his testimony that the second shipment of about 1000 pounds of hardened oil was sent to Macon, Georgia, by The Procter & Gamble Company. You
173 have not any reason to doubt that statement, have you?

A. I have no recollection of it.

Q. 124. Did you go to Macon, Georgia, during 1908, and visit the plant of the McCaw Manufacturing Company?

A. Yes.

Q. 125. When did you go?

A. It must have been in October or November, I guess.

Q. 126. You went down to look over the plant?

A. Yes.

Q. 127. And you made a careful examination of it?

A. Yes.

Q. 128. Prior to that time had The Procter & Gamble Company, or any of its subsidiary companies, been manufacturing lard substitutes?

A. No.

Q. 129. When you went to Macon, Georgia, did you see any of the compound that had been previously made by the McCaw Manufacturing Company from the hardened cotton-seed oil, which had previously been sent to that Company from Procter & Gamble Company in Cincinnati?

A. No.

Q. 130. Did you ever see any of the compound that was made by Mr. McCaw during 1908, in which hardened cotton-seed oil was used?

A. No.

Q. 131. During 1908, did you see any material in which that hardened cotton-seed oil was compounded with cotton-seed oil?

A. No.

Q. 132. When was the first time you saw any product comprising cotton-seed oil and hardened cotton-seed oil?

A. I don't know exactly, but I must have seen it during 1909.

Q. 133. Where do you think you saw it?

A. At Ivorydale or Cincinnati.

Q. 134. Was that made at Ivorydale?

A. No.

Q. 135. Where was made?

A. Macon.

174 Q. 136. And that first compound that you saw not only included cotton-seed oil and hardened cotton-seed oil, but also included beef stearin, did it not?

A. Yes.

Q. 137. When was the first time that you ever saw any lard substitute consisting only of hardened cotton-seed oil and cotton-seed oil?

A. Why, I don't recall when that was; it was several years later.

Q. 138. Some time in, perhaps, 1912?

A. It must have been 1912, or maybe later than that.

Q. 139. When did Procter & Gamble Company at Ivorydale first produce any material including hardened cotton-seed oil, suitable for use as a lard substitute?

A. 1910. I made a memorandum of that date (consulting memorandum). The first, Flake White, April, 1910.

Q. 140. What is Flake White?

A. Lard substitute.

Q. 141. That was the trade name of the lard substitute which had been previously made by the McCaw Manufacturing Company, was it not?

A. Yes.

Q. 142. And this Flake White, you say, was produced at Ivorydale some time in 1910?

A. Yes.

Q. 143. How did it differ from the Flake White which was made say, in the middle of 1909?

A. Made in the middle of 1909 at Macon?

Q. 144. Yes?

A. Not at all, I have no recollection of any difference.

Q. 145. So that the Flake-White you referred to as having been produced at Ivorydale consisted of hardened cotton-seed oil, oleo stearin and cotton-seed oil?

A. Yes.

Q. 146. Did you see the manufacture of Flake-White at Macon, Georgia?

A. I don't recall that I—I am quite sure that I did not see
175 Flake-White or any lard compound manufactured until we made it at Ivorydale, except on my one visit to Macon in 1908, when I was there inspecting the plant.

Q. 147. And when you were there inspecting the plant, Flake-White was made by adding beef stearin to cotton-seed oil, was it not?

A. I understood it so. I was not there for that purpose; I knew nothing about it.

Q. 148. And when the first Flake-White was produced at Ivorydale, it was made of cotton-seed oil, hardened cotton-seed oil, and animal oleo stearin, but was sold under just the same name of the previous material, to wit, Flake-White?

A. Yes.

Q. 149. And it was sold for the same purpose for which Flake-White had been previously sold?

A. As far as I know.

Q. 150. You, never had any complaint about that Flake-White produced at Ivorydale, did you?

A. Never.

Q. 151. And presumably the purchasers used it for the same purpose for which they had previously used the Flake-White made by the McCaw Manufacturing Company at Macon, Georgia?

A. Yes.

Q. 152. When did you first leave the beef stearin out of Flake-White?

A. I don't recall the date.

Q. 153. Well, can you state approximately when that was; was it in 1911, or 1912?

A. I can only make a guess at it. We would have to refer to the records, but I think we certainly used it for two years after starting at Ivorydale. That would be my estimate of the time.

Q. 154. You say you started in Ivorydale when?

A. April, 1910.

Q. 155. So that presumably you did use the oleo stearin in that Flake-White until 1912?

A. Yes.

Q. 156. After you stopped using the oleo stearin in Flake-
176 White, did you have any complaint from purchasers regarding it?

A. No.

Q. 157. They accepted it as substantially the same kind of material as they had previously used, so far as you know?

A. Yes.

Q. 158. And it was, so far as you know, put to the same use for which Flake-White had previously been used?

A. Yes.

Q. 159. Previous to, say, November, 1910, did you at Ivorydale ascertain the iodin value of the various oils which you were hardening?

A. November, 1910?

Q. 160. And prior to November, 1910?

A. What does that date represent? What date does that refer to?

Q. 161. Well, that particular date that I refer to was nearly two years after Mr. Kayser had first begun to use his apparatus for hydrogenating oils.

A. What was your question?

Q. 162. (Question Number 159 read.)

A. I think we did prior to November, 1910, determining the iodin value of some of the oils hardened.

Q. 163. I think probably you misunderstood my question. Did you ascertain the iodin value of cotton-seed oil, not hardened cotton-seed oil?

A. Oh, undoubtedly we did.

Q. 164. And what was approximately the iodin value of the cotton-seed oil which you were hardening?

A. I don't know, but I presume they were about like standard cotton-seed oils.

Q. 165. And that would be about——

A. I think the iodin value of cotton-seed oil is about 110, is my recollection of it.

Q. 166. It ranges approximately from 108 to 110?

A. That is my recollection of it.

Q. 167. And you think so?

177 A. We do not bother much testing the iodin values of cotton-seed oil now.

Q. 168. Did you ascertain the iodin value of the liquid fatty acids of cotton-seed oil prior to the filing of Mr. Burchenal's application in suit, which took place on November 10, 1910?

A. Well, I had nothing to do with it. I don't know whether it was done or not.

Q. 169. Who did have to do with that?

A. Mr. Burchenal.

Q. 170. And was he the only one who had to do with it?

A. He did his work in connection with the laboratory, not with any particular man—I am not a chemist.

Q. 171. But you have a fair working knowledge of the chemistry involved in these matters of hydrogenation, have you not?

A. Yes.

Q. 172. Prior to November 10, 1910, did you or any one else at Ivorydale ascertain the iodin value of the liquid fatty acids of any of the hardened cotton-seed oils?

A. Prior to November, 1910? I think not.

Q. 173. Who would know positively about that?

A. I don't know of any one who would.

Q. 174. Would your records show the facts?

A. No.

Q. 175. Prior to the filing of Mr. Burchenal's application on November 10, 1910, for the patent in suit, had you, or had any one else at the Procter & Gamble Company ascertained the proportions of the component glycerids of cotton-seed oil?

A. Not to my recollection.

Q. 176. And not to your knowledge?

A. Not to my knowledge.

Q. 177. Who would know if that had been done?

178 A. Mr. Burchenal.

Q. 178. And would he know who did it?

A. I think he would.

Q. 179. Prior to the filing of Mr. Burchenal's application for the letters patent in suit on November 10, 1910, had the Procter & Gamble Company, or Mr. Burchenal, or any of the employes of the Procter & Gamble Company, ascertained the proportions of the component glycerids in the product resulting from the hydrogenation of cotton-seed oil?

A. Not to my knowledge or recollection. I haven't any recollection of what was done, or any knowledge of what was done along that line.

Q. 180. Who would know what was done?

A. Mr. Burchenal, if any one.

Q. 181. And he, if any one, would certainly know that fact?

A. Yes.

Q. 182. When did the Procter & Gamble Company first begin to ascertain the proportions of the component glycerids in the product resulting from the hydrogenation of cotton-seed oil?

A. I don't know.

Q. 183. Did they ascertain the proportions of those component glycerids from the product inquired about in the previous question?

A. What was the product in the previous question?

Q. 184. The product produced by hydrogenization of cotton-seed oil?

A. Some of the product.

Q. 185. When did they first begin to ascertain the proprotions of the component glycerids in some of these porducts?

A. I don't know.

Mr. Allen: Counsel for the Procter & Gamble Company objects to this line of inquiry on the grounds previously stated; also, because the Court has refused to allow interrogatories, and without
179 repeating the objection, it is understood that this objection is made to each and every question along this line.

Mr. May: Counsel for defendant desires to state of record that there are certain affirmative defenses which have been made in the answer and amended answer in this suit; that the matters inquired about relate specifically to those defenses, and the purpose of the inquiries will certainly appear during the course of the examination. The foregoing statement of counsel is made in answer to the various objections which have from time to time been raised by counsel for the plaintiff, and applies equally to the objections that were made to the introduction of evidence, as to the apparatus, processes, and the product of Mr. Kayser, the various substances which were manufactured by the Procter and Gamble Company in which hardened cotton-seed oil was used, and to the processes and products of the McCaw Manufacturing Company, from the time prior to 1908, until 1911 or 1912. It is agreed that these replies may be taken nunc pro tunc to the previous objections.

Q. 186. Are you familiar with the method by which the iodin value of the oil, or the liquid fatty acids of the oil, is ascertained?

A. No.

Q. 187. Who is familiar with that?

A. Our chemist.

Q. 188. Can you give me the name of the chemist?

A. Mr. Morrison.

Q. 189. Mr. Harley J. Morrison?

A. Yes.

Q. 190. Anyone else?

180 A. Why, I don't know which men in the laboratory are familiar with the tests.

Q. 191. Mr. Ven Zoul?

A. Oh, he undoubtedly knows it.

Q. 192. Anyone else?

A. Well, I assume that Mr. Knight is familiar with the method.

Q. 193. You have never determined the iodin value of any of these——

A. Never—I have never done any laboratory work.

Q. 194. Do you know what method was followed in separating the liquid fatty acids?

A. No.

Q. 195. Were the hardened cotton-seed oil products produced by Mr. Kayser in 1908, put to any use other than for edible products?

A. Well, all that was used for edible products—if that was used for edible products—was what was sent to Macon, Georgia. I don't know what was done with it.

Q. 196. But so far as you know, was any of the hardened product produced from cotton-seed oil by Mr. Kayser during 1908, used for any purpose other than for making edible products?

A. Yes.

Q. 197. What other use?

A. Soap purposes.

Q. 198. When Mr. Kayser left this country, did he take his note-books with him?

A. I think he did—I haven't seen any of them.

Q. 199. You haven't seen them since he left?

A. No.

Q. 200. When the larger plant was installed in 1909, was there introduced any means for deodorizing the product—or installed at the same time?

A. I think not.

Q. 201. When did you first install a deodorizer for the products containing or consisting of hardened cotton-seed oil?

A. Oh, I would state that that was perhaps a year later—within a year.

Q. 202. Some time during 1910; is that what you mean?

A. No, we started in February, 1909; I say, within a year of that.

Q. 203. And was that deodorizer uesd for deodorizing hardened cotton-seed oil?

A. Yes.

Q. 204. Is the method of deodorizing the products one of the secrets of the Procter & Gamble Company, so that you would not care to tell about it?

A. Yes.

Q. 205. That has ever since then remained as one of the secrets of the Procter & Gamble Company? That is to say, the method of deodorizing the product resulting from the hydrogenating operation?

A. Yes.

Q. 206. During the year 1909 was any apparatus installed for removing nickel from the hardened product?

A. Yes.

Q. 207. And in what did that consist?

A. Filter presses.

Q. 208. Just ordinary filter presses?

A. Yes.

Q. 209. And the method of filtration of the hardened product has not been changed since that time?

A. Oh, at the beginning I think we filtered it through paper; we don't filter it through paper now.

Q. 210. How do you filter it?

A. Through cloth.

Q. 211. Do you use any other filtering material except cloth, or in addition to cloth?

A. Any other filtering material?

Q. 212. Yes?

A. No.

Q. 213. Do you use any other material in the filter press in addition to cloth?

A. In the filter press? How do you mean?

Q. 214. You use an ordinary filter press?

A. Yes.

Q. 215. With filter cloth and nothing else?

A. Yes, filter cloth, yes.

Q. 216. Is the hardened oil treated in any other way than
182 by the filter press, for the removal of the nickel?

A. No.

Q. 217. During 1909 was the product resulting from the catalytic hydrogenation of cotton oil subjected to any treatment for the removal of the characteristic odor of hydrogenation?

A. Deodorized; I think that was done during 1909.

Q. 218. Was any treatment given the product for removing the taste, which Mr. Burchenal said was a characteritic taste resulting from the hydrogenation?

A. Why, they are both done at the same time.

Q. 219. And the removal of the odor and flavor due to hydrogenation were accomplished during the year 1909?

A. Yes.

Q. 220. And was Mr. Burchenal familiar with those operations?

A. Yes.

Q. 221. Were those operations necessary in order to make the hydrogenated product palatable, or commercially salable as an edible product?

A. I think not.

Q. 222. Why not?

A. I think the product is entirely edible without that. It is just a matter of standard or quality that is desired. It would improve the quality.

Q. 223. You would not put it on the market, however, without passing the product through this treatment, would you?

A. Why, it can be done. It is just as good as some that are on the market now.

Q. 224. But the Proctor & Gamble Company never have placed on the market any of the lard substitute containing or consisting of hardened oil, without subjecting such product to treatment for the removal of the characteristic odor and flavor due to hydrogenation, have they?

A. No.

183 Q. 225. Have you had any talk recently with Mr. Burchenal touching this matter of the edibility of the product without treating it for the removal of the odor and taste?

A. No.

Q. 226. Or with Mr. Allen?

A. No.

Q. 227. Have you read, or had told you, any of Mr. Burchenal's testimony he has given in this case?

A. I have seen a part of it.

Q. 228. That is, you read it before you came on the stand today?

A. Read it.

Q. 229. What is necessary to render a hydrogenated refined cotton oil, having a melting point of 42, a commercially edible lard substitute?

A. Well, I don't know that it can be made a lard substitute. I am not familiar enough with the melting point of 42.

Q. 230. I mean 42 degrees Centigrade?

A. Forty-two degrees Centigrade—I don't know whether that would make a lard substitute or not; it may be too hard, and it may be too soft.

Q. 231. In Mr. Burchenal's application for letters patent as originally filed by him, the melting point range of the product was stated to be 36 to 43 degrees Centigrade, preferably 41 to 42 degrees Centigrade. Would you say that a product having a melting point of 42 degrees Centigrade, resulting from the catalytic treatment of cotton-seed oil with hydrogen, would be a palatable, edible lard substitute or product?

A. Yes.

Q. 232. And that would be true even though the product resulting from the hydrogenation were not treated to remove the characteristic odor and taste resulting from the hydrogenation?

A. Yes.

Q. 233. And you would regard such a product as a commercially edible lard substitute?

A. Yes.

Q. 234. And you would make the same answers if the 184 questions had inquired specifically as to such a product having a melting point of 43 degrees Centigrade?

A. What did those other questions refer to—42 degrees Centigrade? I think so.

Q. 235. And would you also say that a product having a melting point of 42 degrees Centigrade and produced by circulating hydrogen gas through cotton-seed oil, in which nickelized Kieselguhr is maintained in suspension by agitators in the presence of hydrogen gas, under pressure, the oil being heated to a temperature of 160 degrees Centigrade, would produce a commercial lard substitute?

A. Yes.

Q. 236. If such a product contained any free fatty acids, it would require but the ordinary treatment known to persons skilled in the art to remove this free fatty acid, would it?

A. You say "any" free fatty acid?

Q. 237. Yes, if there were any?

A. Any appreciable amount.

Q. 238. You misunderstand my question. (Question 236 read)?

A. Now, which question do you want answered?

Q. 239. (Question Number 236 read)?

A. Well, I don't think it requires any treatment if the percentage of free fatty acid is slight.

Q. 240. But if there are any free fatty acids in the product, it would require only the ordinary treatment known to persons skilled in the art to remove it, would it not?

A. Yes.

Q. 241. Would a product having a melting point of 43 degrees Centigrade, as produced by causing cotton-seed oil to chemically absorb hydrogen in the presence of nickelized Kieselguhr maintained in suspension therein by agitators and heated to a temperature of about 155 degrees Centigrade, be liquid at ordinary atmo-
185 spheric temperature ranging from 65 to 85 degrees Fahrenheit?

A. That is a pretty wide range, from 65 to 85 degrees Fahrenheit. I don't think it would be at 65; it might be at 85 degrees.

Q. 242. At what temperature would such a product be liquid?

A. I don't know.

Q. 243. Would it form a semi-solid at, say, 70 degrees Fahrenheit?

A. I don't know.

Q. 244. Would such a product be liquid at, say 75 degrees Fahrenheit?

A. I don't know.

Q. 245. Did you personally ever do any cooking with a product having a melting point ranging from 36 degrees to 43 degrees and produced by hydrogenizing cotton-seed oil in the presence of a nickelized Kieselguhr contained in suspension in the oil by agitators in the presence of an atmosphere of compressed hydrogen, in which the oil was heated during the hydrogenization to a temperature of 155 degrees Centigrade, without first subjecting the product to deodorization?

A. No.

Q. 246. So that you don't know of your own personal experience whether such a product can be used for cooking or like purposes?

A. No.

Q. 247. Did you ever eat any of such product?

A. Yes.

Q. 248. How much of it have you eaten?

A. Well, that is difficult to say. I have tasted a good deal of it and eaten it in the development of this work—and I am still alive.

Q. 249. Then I take it you consider that anything is edible which does not poison one?

A. Hardly that.

Q. 250. Well, almost that, would you not?

A. Not at all.

Q. 251. Would you regard linseed oil as edible?

186 A. No; not as I have observed it. Perhaps it can be made edible.

Q. 252. Do you regard cotton-seed oil as edible?

A. Yes.

Q. 253. Would you regard such a product, having that melting point and produced in the manner which I have described in the previous question, as being edible without the removal of the Kieselguhr and nickel?

A. No.

Q. 254. It would be absolutely essential, before such a product would be edible, to remove the catalyst, would it not?

A. Yes.

Q. 255. What is it necessary to do with such a product to give it the appearance of commercial lard?

A. To subject it to the same process that lard is subjected to.

Q. 256. Is that all?

A. I think so.

Q. 257. At what temperature is it necessary to chill the rolls?

A. It varies from zero to 40 degrees above Fahrenheit.

Q. 258. And at any temperature between zero and 40 degrees Fahrenheit to which the rolls are chilled, that would be sufficient when the product is passed over the rolls to give it the appearance of commercial lard?

A. It is my opinion that it could be manipulated.

Q. 259. What effect does a variation in the temperature of the rolls have upon the appearance of the product?

A. Upon the appearance of the product?

Q. 260. Yes?

A. My observation would tell me that it is more lumpy at the low temperatures.

Q. 261. Is lard lumpy? Is commercial lard lumpy?

A. Lard can be made lumpy.

Q. 262. Is commercial lard lumpy?

A. No.

187 Q. 263. What effect does a variation in the speed of rotation of the picker-shaft, in the picker-box, have upon the appearance of the lard, or of the product which we have been talking about?

A. It makes it lighter in gravity, by incorporating more air into it.

Q. 264. But it does not otherwise change the appearance?

A. I think not.

Q. 265. Is it your opinion that a product having a melting point of, say, for example 42 degrees Centigrade, and produced by treating cotton-seed oil with hydrogen in the presence of an atmosphere of compressed hydrogen, and in the presence of nickel deposited upon Kieselguhr, and maintained in suspension in the oil by agitation, the oil being heated to a temperature of 155 degrees to 160 degrees Centigrade, and without being subjected to treatment to remove the characteristic taste and odor due to hydrogenation, would be commercially acceptable as a fat for use in frying, or as a fat for use in shortening dough?

Mr. Allen: The question is objected to as incompetent, indefinite and misleading; also as irrelevant and immaterial.

A. Why, I would consider such a product entirely edible; but to be a commercial success, it would be preferable to subject the product to the treatment to which lard and other cooking fats are regularly subjected—or usually subjected.

Q. 266. Would such a product be commercially suitable for frying food, or making biscuit, for example?

Counsel for plaintiff interposes the same objection heretofore noted.

188 A. Commercially suitable?

—. How does "commercially" enter into that?

Q. 267. It enters into the question?

A. Now, what is your question?

Q. 268. (Question 266 read)?

A. It would be suitable, but it would be improved by subjecting the product to the same processes and treatment to which lard and other edible products are usually subjected.

Q. 269. Would it be commercially suitable for the use which I have inquired about?

A. Put "commercially" in my answer.—It would be commercially suitable, but it would be better——

Q. 270. That is your opinion, is it?

A. That is my opinion.

Q. 271. Have you ever tried to sell any such a product for that purpose?

A. Never.

Q. 272. Was the hardened oil which was used in the production of lard substitutes during the year 1909 by the Procter & Gamble Company subjected to a Fuller's Earth treatment?

A. It was.

Q. 273. What was the purpose of subjecting the hardened oil to that treatment?

A. It was for the purpose of clarifying the oil and removing the traces of moisture.

Q. 274. To what temperature was the oil heated prior to passing through the Fuller's Earth?

A. I don't know.

Q. 275. Did you ever know?

A. I don't think I did.

—. 276. So that in addition to being deodorized and filtered, chilled by refrigerated chilling rolls and beaten, it was also subjected to Fuller's Earth treatment, was it?

A. Your question referred to the material made in 1909? That

189 was all used at Macon, was deodorized at Macon, with the oils, and the Fuller's Earth was put in to clarify the mixture. It was done at Macon. I was not familiar with the temperature at which it was done, and it was done before passing to the chilling roll, not after.

Q. 277. How about at Ivorydale prior to 1910, were the products containing or embodying or consisting of cotton-seed oil, which had been subjected to the hydrogenating treatment, treated to deodorize them, treated with Fuller's Earth, subjected to the action of refrigerated rolls and to the action of a beater?

A. No.

Q. 278. When did you first attempt the Fuller's Earth treatment at Ivorydale?

A. I don't know. I don't recall.

Q. 279. Was it after November, 1910, or before that time?

A. It was after April, 1910.

Q. 280. And possibly before November, 1910?

A. Yes.

Q. 281. Ivorydale is the name of the plant of the Procter & Gamble Company in Cincinnati, or the name of the place wherein that plant is located, is it?

A. The name of the plant.

Q. 282. In the treatment of cotton-seed oil by hydrogenization, the oil gradually grows harder, does it not?

A. The oil gradually grows harder, you say?

Q. 283. Yes?

A. I guess that is the proper way to express it. It gradually becomes harder.

Q. 284. That is to say, the reaction is a progressive one and the oil or material undergoing treatment gradually changes from its original liquid consistency to a semi-solid consistency, then to a relatively hard consistency, does it not?

A. Yes.

Q. 285. In the apparatus that Mr. Kayser used during the year 1908, the admission of the hydrogen to the hydrogenator was
190 controlled by a valve, was it not?

A. Yes.

Q. 286. Do you create a distinction between a product that is edible and a product which is commercially edible?

A. What is that question?

Q. 287. Do you distinguish between a product that is edible and a product that is commercially edible?

A. Yes.

Q. 288. In other words, you take the position that a product may be edible, but that it might not be commercially edible?

A. Yes—is lard edible before they get through treating it?

Q. 289. I never tasted it.

A. Taste it sometime and see what white grease tastes like.

Q. 290. Is it lard in that condition?

A. When they can't sell it as lard, they sell it as white grease.

Q. 291. And is white grease commercially edible?

A. Not under that name.

Q. 292. You do not regard linseed oil, as I understand you, as edible?

A. I have had very little experience with linseed oil. As I have seen it, as we have used it in our paint shop it is not edible.

Q. 293. Were you aware that linseed oil is eaten by natives of Russia and other places as an edible oil?

A. I was not.

Q. 294. If you assume my statement that natives do use linseed oil as an edible oil in Russia, to be true, do you even then consider it as an inedible oil?

A. The linseed oil I have had experience with would, by me, be considered inedible. There may be varying grades of linseed oil, if they eat it.

Q. 295. Do you consider crude cotton-seed oil to be edible?

A. No.

Q. 296. And if crude cotton-seed oil were subjected to the hydrogenizing action, so that the hydrogenated product would have
191 a melting point of say, forty degrees centigrade, would you consider such a product to be edible, either commercially or otherwise?

A. We have never tried it, but I would think it would be rather inedible, decidedly inedible.

Q. 297. So that in order to produce an edible hydrogenated product, it is absolutely necessary to start with an edible oil?

A. Yes.

Q. 298. So that you cannot make necessarily an edible product by taking any vegetable oil and hydrogenizing it to a product which would cool at, say, forty-one or forty-two degrees centigrade?

A. We have never yet succeeded in making that transformation.

Q. 299. So that it would not necessarily follow that such a product would be an edible product?

A. If you started with——

Q. 300. —with any vegetable oil?

A. No.

Q. 301. Would you regard a product resulting from the hydrogenation of cotton-seed oil, having an iodin value of, say, fifty-two, and a melting point of thirty-nine degrees centigrade, as an edible product?

A. It might be edible; it might be inedible, depending upon the kind of oil you had to begin with and the way it was processed.

Q. 302. You mean the way the product was treated for deodorization?

A. Yes. There are cotton-seed oils that are not edible.

Q. 303. So that unless you were told what oil to start with, and were merely told to take any vegetable oil, or to take a cotton-seed oil and hydrogenate it to a point where it had a melting point of forty-two or forty-three degrees centigrade, it would be necessary for you to experiment considerably before you could produce a commercially edible product?

A. I don't believe I understand that question at all.

192 Q. 304. (Question read).

A. With any lot of cotton-seed oil in mind, I can tell prior to its hydrogenation treatment whether or not it will be edible or inedible.

Q. 305. That is because you have had considerable experience in hydrogenating oils?

A. Yes, and because I have had considerable experience with cotton oils.

Q. 306. In producing from cotton oil a hydrogenated edible product, having a low linolin content, and a high olein content, with just enough stearin to make the product congeal at ordinary temperatures, what factors of proportion of catalyst to oil, degree of agitation, temperature, and of pressure, are necessary to produce such a product?

A. All of them; and in addition to that, the element of time.

Q. 307. So that one must know in advance of all those factors in order to produce such a product?

A. Yes.

Q. 308. It would not be sufficient merely to give you the temperature of the hydrogenation, without giving you the degree of pressure and the proportion of catalyzer to oil, would it?

A. It would not be sufficient for what?

Q. 309. It would not be sufficient to enable you to produce a product having a low linolin content, and a high olein content and with enough stearin to cause the product to congeal at ordinary temperature?

A. Yes; you can do that.

Q. 310. What factors would it be necessary for you to know in order to do that?

A. Well, your question refers to an oil having a low linolin and a high olein, without any more specific description or definition than that? That could be, in my opinion, accomplished by percentage of catalyzer and agitation.

193 Q. 311. But without being informed as to the percentage of catalyzer and the degree of agitation, can you, without experimentation, produce such a product having a low linolin content and a high olein content, and with just enough stearin to cause the product to congeal at ordinary temperature?

Mr. Allen: The question is objected to as misleading and indefinite.

A. If we did, it would be rather a lucky strike, because the size of the machine and many other elements enter into it.

Q. 312. It is necessary to have information as to these various other elements in order to produce such a product?

A. You would have to accommodate your information as to the speed of the agitator, etc., to the size of the machine you had in operation. I couldn't tell you to run an agitator at two hundred revolutions per minute if you had a machine that was very large, because you wouldn't run it many minutes; as your machine gets larger, you must necessarily keep your speed down, or reduced. You can't describe or outline degrees of agitation in any other way that I know of, except by revolutions per minute, and the revolutions per minute that apply to a small machine will not apply to a large machine.

Q. 313. But the proportion of catalyzer to oil would apply to the use of a small machine, just as much as to a large machine?

A. Yes; we can tell you the proportion of catalyzer that would give you the results, in either machine.

Q. 314. And you would obtain that information by a considerable amount of experimentation, I take it?

A. We did.

Q. 315. Yes. And it was necessary to experiment considerably before you got that information, or got that knowledge?

194

A. Well, we experimented. We experimented quite a while to get the percentages that would be applicable under any conditions.

Q. 316. What percentage of catalyzer is necessary in order to produce the product?

A. I think you can do it, under almost any conditions, with ten per cent.

Q. 317. That is to say, ten per cent. by weight of nickel to the oil, by weight?

A. Yes.

Q. 318. And such a proportion is practically necessary in order to get a product having a high olein content and a low linolin content?

A. No. No, I am only giving you that proportion as a proportion that will bring about a reaction, under low or high speed agitation, or any other varying degrees of agitation.

Q. 319. So that the proportion of catalyzer to oil must be correlated to the degree of agitation?

A. It "must" not be, but it is better that it should be.

Q. 320. I wish you would explain that answer, Mr. Anderson?

A. What explanation do you want?

Q. 321. Well, I want sufficient explanation so that I can understand what you mean?

A. Well, in what way is it not clear to you?

Q. 322. What correlation of proportion of catalyzer to oil, and degree of agitation, is necessary to produce a product having a low linolin content and a high olein content?

A. At higher speed——

Last above question is objected to as irrelevant and immaterial.

A. At a higher speed, less catalyzer is essential, because it is more readily kept in suspension. That is simple enough.

195

Q. 323. Suppose that you had never tried to produce a hydrogenated product having, say, five to ten per cent. linolin, and sixty to seventy per cent. olein, and the balance saturated fats, and all that you were told, was, that the oil, during hydrogenation, was heated to a temperature of 155° Centigrade, in the presence of an atmosphere of compressed hydrogen, and that nickel deposited on kieselguhr was maintained in suspension in the oil by agitation—would you be able to produce such a product without experimentation?

Above question is objected to as indefinite and misleading.

A. Not being a chemist, I perhaps, would not; but I would employ a chemist and I think any chemist ought to be able to.

Q. 324. You have had considerable experience in the hydrogenation of oil, have you not?

A. Yes.

Q. 325. Extending over how many years?

A. Eight years. I answered your question, though, assuming that I had no information whatever, no information at all, except just what you stated. I am not answering the question assuming that I had knowledge beside the information you gave or stated—but I do know.

Q. 326. Who, besides Mr. Burchenal, Mr. Kayser and yourself, saw or became familiar with any of the processes or products carried on or produced by Mr. Kayser during 1908 and 1909?

A. Well, during 1908, no one but Mr. Burchenal and myself. We occasionally gave Mr. Kayser a laborer to help him, but we changed the laborer every week. He did all the work himself and no one came in contact with him but Mr. Burchenal and myself.

196 Q. 327. How about 1909?

A. 1909, after we started the plant, Mr. Leach was introduced into it.

Q. 328. Since that time the process——

A. And it has gradually broadened out since that time. In the first two years we would arrest anyone—anybody who was seen talking to Kayser, except ourselves.

Q. 329. That same degree of secrecy has practically been preserved ever since?

A. Oh, no; it has broadened quite a lot beyond that—quite a few people now know about it.

Q. 330. Quite a few people know it, in order to carry on the process?

A. In order to carry on the large volume of business, to take care of the increased work.

Q. 331. But the knowledge is confined to such people as you employ?

A. Yes.

Q. 332. The knowledge is confined to such people as you employ in making the hardened oil or substance?

A. In the beginning, our laboratory people did not know anything about it, as such.

Q. 333. And you, up to the present time, keep the knowledge from the public just as far as it is possible to do so?

A. Just as far as we know how.

Q. 334. I suppose, after your first visit to the Macon plant, you frequently made visits there, or occasionally made visits there, to see how the work was being carried on, and kept general supervision of it?

A. I don't think I visited the Macon plant during the—I went down there in October or November, 1908; I went down to make an appraisement of the plant before we bought it.

Q. 335. After that time——

A. After that time I had nothing to do with the plant until, I think it was—it must have been 1910.

Q. 336. Mr. McCaw had charge of it?

A. Until he moved up here; then it was transferred to me.

197 Q. 337. After 1910 it was under your supervision?

A. I think, since 1910, I have been down there twice annually.

Q. 338. Is there any substantial difference between the process which you employ for the manufacture of hardened cotton-seed oil for soap stock, and hardened cotton-seed oil for edible purposes?

A. Any substantial differences?

Q. 339. Yes?

A. Well, we have to use for soap purposes a higher percentage of catalyst, higher temperatures; those are the principal differences.

Q. 340. Otherwise the process of hydrogenization is substantially the same?

A. Yes.

Q. 341. You use a better grade of oil for making lard substitute than for soap stock, I take it?

A. The best we know how to get, we use for lard substitute.

Q. 342. You regard that as highly desirable?

A. We regard it as highly desirable to make a first-class product, and that is what we are trying to make.

Q. 343. What effect does a variation in the amount of catalyzer, or in the proportion of catalyzer to oil, have upon the proportions of the component glycerids in the product?

A. Well, that is varying—the results are varying. The results vary with the conditions, but my opinion is, that the higher the percentage of catalyzer, the higher percentage of the stearin produced. Less olein—and perhaps the linolin is not reduced in the same proportion, as when the lower percentages are used.

Q. 344. What effect does a variation in the temperature to which the oil undergoing hydrogenation is heated, have upon the

198 proportion of the component glycerids in the product?

A. Again the results vary with conditions; but the higher temperatures act similarly to high percentages of catalyzer.

Q. 345. What effect does a difference in the pressure of the atmosphere of hydrogen have upon the proportion of the component glycerids in the product?

A. Not a great effect.

Q. 346. But it has some effect?

A. Some slight effect.

Q. 347. What would you say is the physical appearance of lard, as it is bought and sold on the market?

A. Smooth and white.

Q. 348. Has such lard a granular texture?

A. Not to any extent as it is bought on the market.

Q. 349. Does it spread on bread, for example, the same as butter?

A. Not the same as butter, no, sir; because butter, on account of the percentage of moisture in it, is more of an emulsion.

Q. 350. Do you know whether lard has a low linolin content and a high olein content?

A. I do not.

Q. 351. I take it you are not familiar with lard?

A. Familiar with lard——

Q. 352. Except as it may be used in your family?

A. We don't use it at all; our experience with it is practically limited. I am fairly familiar with the tests we make regularly, but as we do not test lard regularly, I don't know much about it.

Q. 353. During 1908 and 1909, you were familiar with all of the work that Kayser did?

A. Yes.

Q. 354. At the Procter & Gamble factory? Procter & Gamble Company?

A. Yes.

Q. 355—In the three larger apparatus which you used in the commercial plant in 1909, were there draw-off cocks?

A. Yes.

199 Q. 356. For the oil undergoing treatment?

A. Yes.

Q. 357. About how full were those three hydrogenators filled with the oil?

A. Nearly one-half full.

Q. 358. Can you give me the dimensions of one of those hydrogenators?

A. About four feet in diameter and about ten feet long; they would hold, full, 7,000 pounds; I said we treated 3,000 pounds in them.

Q. 359. What were the revolutions per minute of the agitators?

A. Why, I think we operated them about twenty-five to thirty revolutions per minute.

Q. 360. Did you afterwards change the speed and revolutions of the shaft carrying those agitators?

A. We finally increased them to fifty, and at fifty we found the shaft wore out so fast that we had to reduce it again.

Q. 361. Who has charge of the hydrogenation? Do you?

A. At Ivorydale?

Q. 362. Yes?

A. I have.

Q. 363. And after Mr. Kayser got through, you assumed the direction of the hydrogenation apparatus, did you?

A. In starting that plant, after we got it assembled, Mr. Kayser and I worked right there together for a week or perhaps ten days. I would work at night time and he would work day time, until we got a night man broken in, with whom it would be safe to leave the plant. Then I assumed charge during the day time and Mr. Kayser went back to his laboratory.

Q. 364. Is a product which has been produced by hydrogenation and having a melting-point of, say, forty-two degrees Centigrade, lard-like, without being rapidly chilled?

A. No—neither is lard.

Q. 365. So that both have to be chilled, to be lard-like?

A. Yes.

200 Q. 366. And chilled rapidly?

A. Chilled rapidly, yes.

Q. 367. In the production of a commercially edible product, consisting of, or comprising hydrogenized oil, do you withdraw samples of the oil undergoing treatment, to determine its consistency, at various stages?

A. Did we?

Q. 368. Do you?

A. Yes.

Q. 369. Why?

A. Why do we?

Q. 370. Yes?

A. To see what we are doing.

Q. 371. To see how the reaction is progressing and to see how the samples appear to be, on cooling, as to consistency?

A. No; we don't care much about them on cooling; we test them in capillary tubes and otherwise.

Q. 372. What is the purpose of these tests?

A. To keep our product uniform.

Q. 373. I wish you would describe those tests to me, in full?

A. We draw a sample in a pan, fill a couple of capillary tubes from the pan, just stick the end of them in, and then let it cool off; throw the rest of the sample away, and we would put those tubes in the melting-point bottle.

Q. 374. So that the purpose of taking samples from time to time is to ascertain the melting-point——

A. To observe the reaction within the machine.

Q. 375. And you can tell that by ascertaining the melting point of the samples?

A. Yes.

Q. 376. Those are the only tests to which you subject the product while it is being hydrogenized?

A. Yes.

Mr. May: I think that is all, Mr. Anderson.

201 Cross-examination.

By Mr. Allen:

X Q. 1. In the Kayser reports of the fat hardening process, E-5, dated as of January 17, 1908, in the first experimental lot there is a paragraph which states: "This material is much superior to the sample from J. Crossfield & Sons which showed an iodin value of 52.26, and a melting point of 39.3, centigrade," then in parenthesis, "The laboratory sample melted at 49.9, centigrade." What does that statement mean, "The laboratory sample melting at 49.9 degrees, centigrade," which immediately follows that statement that the melting point is 39.3 degrees centigrade, of the material?

A. I have not any remembrance of it at all. I cannot explain it, unless it was reported as 39.9 by Crossfield and our test was 49.9.

Aside from that I don't know about it. I am not familiar enough with what 52.26 iodin ought to show; there is a relation, but I don't know what it is.

Mr. Allen: That is all.

A. E. ANDERSON.

Oct. 11, 1916.

202 In the District Court of United States, Southern District of New York.

In Equity. No. 13—100.

PROCTER & GAMBLE COMPANY, Plaintiff,

vs.

BERLIN MILLS COMPANY, Defendant.

STATE OF OHIO,
County of Hamilton, ss:

I, Boyd E. Dilley, Clerk of the United States District Court for the Southern District of Ohio, duly commissioned and authorized to administer oaths, and to take and certify depositions, named as Special Examiner in the order of Honorable Martin T. Manton (of which a duly certified copy is hereunto annexed), and acting as such Special Examiner, do hereby certify that the foregoing depositions of the aforenamed witnesses, John J. Burchenal, Wallace Eugene McCaw and Albert Edward Anderson, were taken before me, de bene esse, on behalf of the defendant in the above entitled cause, pursuant to the annexed notice, under and in accordance with the provisions of the statutes of the United States in such case made and provided: that the depositions were taken at my office, No. 317 Federal Building, in Cincinnati, Ohio; that each of the aforenamed witnesses, who were of sound mind and lawful age, was by
203 me first carefully examined and cautioned and duly sworn according to law to testify the truth, the whole truth and nothing but the truth, before the commencement of his testimony; that said witnesses thereupon respectively testified as is above set forth; that the depositions of said witnesses were taken stenographically from the dictation of said witnesses by Miss Antoinette Jackson and Douglas A. Brown, and by them reduced to writing; that the plaintiff was represented at the taking of such depositions by Alfred A. Allen, Esq., and the defendant by Marcus B. May, Esq., and Frank E. Barrows, Esq., as appears in the record; that the depositions were taken at the place specified in the annexed notice, and by agreement of counsel on October 4, 5, 6, 7, 9 and 10, commencing at ten o'clock A. M., on Wednesday, October 4, 1916, and continuing from day to day pursuant to adjournments until they were concluded on Wednesday, October 10, 1916, as appears in the record; that each of the said witnesses read over his deposition thus given before signing the same and then signed the same in my presence, and that

I attested his signature, and that the exhibits introduced in evidence during the taking of such depositions were marked by me, and in accordance with agreement of counsel set forth in said record were retained by counsel introducing the same.

I do further certify that the reason for taking said depositions was, and is, and the fact was, and is, that each of said named witnesses resides in Ohio, more than one hundred miles from the place where said cause is appointed by law to be tried; that I am neither of counsel nor attorney to either of the parties, nor connected by blood or marriage to either of the parties to this case, nor interested directly or indirectly in the matter in controversy, or in the event or result of this cause; that the said depositions have remained exclusively in my possession from the time they were taken until the time of their transmission to the Clerk of the United States District Court for the Southern District of New York; and that it being impracticable for me to deliver said depositions with my own hand unto the court for which they were taken, I have retained the same for the purpose of sealing them up, and after so sealing them, have directed with my own hand and speedily and safely transmitted the same to said court for which said depositions were taken, and there to remain under by seal until opened.

204

Witness my hand and seal as such Special Examiner, at Cincinnati, Ohio, on this 17th day of October, 1916.

[SEAL.]

B. E. DILLEY,
Clerk of the United States District Court, Southern District of Ohio.

205 *Stipulation.*

In the District Court of the United States, Southern District of New York.

In Equity. No. 13—100.

On Burchenal Patent, No. 1,135,351.

PROCTER & GAMBLE COMPANY, Plaintiff,

vs.

BERLIN MILLS COMPANY, Defendant.

Depositions taken de bene esse Pursuant to Section 863 et seq., Revised Statutes, in Behalf of the Defendant, before me, Boyd E. Dilley, Clerk of United States District Court for the Southern District of Ohio, at Room No. 317, Federal Building, Cincinnati, Ohio, October 27, 1916, pursuant to agreement of counsel.

Present: Alfred M. Allen, Esq., in behalf of the plaintiff; Marcus B. May, Esq., and Frank E. Barrows, Esq., in behalf of the defendant.

Stipulation.

It is hereby stipulated and agreed by and between plaintiff and defendant, acting by their respective counsel, that the following depositions of William Cooper Procter, John J. Burchenal, Albert Edward Anderson, Wallace Eugene McCaw and Harley J. Morrison, all residing in Ohio, and James N. McCaw, residing at Macon, Georgia, heretofore taken in the cause in equity now pending in the
206 District Court for the Northern District of Illinois, Eastern Division, wherein Procter & Gamble Company is plaintiff and Swift & Company is defendant, before Boyd E. Dilley, Esq., Clerk of United States District Court for the Southern District of Ohio, acting as Special Examiner, commencing on October 19, 1916, and continuing from day to day, subject to adjournments, concluding on Thursday, October 27, 1916, may be captioned, accepted as evidence and used at final hearing in this cause, all with the same force and effect as if originally taken herein under the order of the court, dated September 23, 1916, subject to the objections noted in said depositions, so far as applicable, and subject to any proper objections as to materiality, relevancy or competency, that may hereafter be made.

ALFRED M. ALLEN,
Of Counsel for Plaintiff.
MARCUS B. MAY,
Of Counsel for Defendant.

I, the aforementioned Boyd E. Dilley, heretofore acting as Special Examiner in said cause entitled Procter & Gamble Company vs. Swift & Company, as well as in the present cause entitled Procter & Gamble Company vs. Berlin Mills Company, do hereby certify that the following is a true and correct copy of the depositions of the said William Cooper Procter, John J. Burchenal, Wallace Eugene McCaw, Albert Edward Anderson, Harley J. Morrison and James N. McCaw, and of the proceedings connected directly therewith, to wit:

207 Pages 1 to 237, inclusive, comprise the depositions in this case already certified and filed. The page number and the question numbering follow consecutively, for convenience of counsel and of the court.

The following exhibits were offered at page 140 but by inadvertence the copies were omitted from the record.

The said letters so offered in evidence by counsel and referred to by the witness, are hereinafter set out by true and compared copies, as

EXHIBIT No. —.

Belmont, Lymm, Cheshire.

October 18, 1907.

DEAR SIRS:

In a few weeks' time I shall be en route to the States, when I purpose introducing a new process of the greatest possible importance to soap-manufacturers.

I have manipulated this process for the last three years and am the only person thoroughly acquainted therewith.

Kindly inform me by the earliest mail if you wish me to call upon you in the first instance and if in that case you are agreeable to refund railway fares from New York or other port to your city.

Yours faithfully, E. C. KAYSER.

Messrs. Procter & Gamble, Soap M'f'cturer, Cincinnati.

(The above letter is written in longhand, in ink.)

208 EXHIBIT No. —.

Form 387.

The Procter and Gamble Co.

Cincinnati, U. S. A.

Established 1857. Incorporated 1890.

Refinery: Ivorydale.

Cable Address: Procter, Cincinnati.

CINCINNATI, October 28, 1907.

Mr. E. C. Kayser, Belmont, Lymm, Cheshire.

DEAR SIR:

Your favor of the 18th inst. received and for which please accept our thanks.

As we have no idea in regard to the process, we cannot, of course, say anything concerning its value to us. We will, however, be very glad to have you talk the matter over with us and if the process is valuable, we will be pleased to consider a proposition from you regarding same.

Awaiting your early reply, we remain,

Yours respectfully,

THE PROCTER & GAMBLE CO.,

Per JOHN J. BURCHENAL.

209 EXHIBIT No. —.

Nov. 9, '07.

DEAR SIRS:

I beg to thank you for your kind favor of the 28th ult.

As far as I know at present, I shall sail from L'pool on the 16th inst. and intend immediately continuing my journey to your city, so that I may have the opportunity of conversing with you before approaching any other firm.

I have no doubt that you will find my process of sufficient importance. Should we however unfortunately fail to arrive at an understanding, when my business will take me back to the coast towns, I trust you will see reason to bear at least part of the expense, connected with my inland journey.

Trusting to see you soon, I remain, Dear Sirs,

Yours faithfully,

E. C. KAYSER.

Messrs. The Proctor & Gamble Co., Cincinnati.

(The above letter is written in longhand, in ink.)

210 WILLIAM COOPER PROCTER, a witness produced in behalf of the defendant, having been first duly sworn, deposes and says as follows in answer to interrogatories:

By Mr. May:

Q. 1. Mr. Procter, will you please state your name, age, residence and occupation?

A. William Cooper Proctor; age fifty-four; residence, Glendale, Ohio, a suburb of Cincinnati, Ohio. My occupation is President of the Procter & Gamble Company.

Q. 2. How long have you been President of the Procter & Gamble Company?

A. About nine or ten years, I think.

Q. 3. And the Procter & Gamble Company is the Plaintiff in this present suit?

A. Yes.

Q. 4. And you were subpœnaed to testify in this case by the defendant?

A. Yes.

Q. 5. What is the business of the Procter & Gamble Company?

A. Manufacturing soaps, oils, lard compounds, and other edible cooking fats.

Q. 6. And a part of the business of the Procter & Gamble Company, or of its subsidiary companies, is the production of refined cotton-seed oils?

A. Yes.

Q. 7. Are you acquainted with Edward Cuno Kayser?

A. Yes.

Q. 8. Will you please state the circumstances under which you first became acquainted with him?

A. I cannot be exact in my memory about that, Mr. May. I don't remember whether we first heard from him by mail, or whether he came to the office one time, came in connection with the process for hardening fats.

211 Q. 9. Mr. Burchenal has testified in this case that there was some correspondence between Mr. Kayser and the Procter & Gamble Company prior to Mr. Kayser visiting the office or plant of the Procter & Gamble Company. You had not seen Mr. Kayser prior to the dates of those letters, had you?

A. No, Mr. Burchenal attended to those details, and he would be more conversant with them than I would be. I don't remember.

Q. 10. According to Mr. Burchenal, Mr. Kayser came to this country in the latter part of November, 1907, and called at the office of the Procter & Gamble Company, probably the last few days of November, 1907. Did you see the samples of hardened oils that he brought with him?

A. Yes.

Q. 11. Had you, previous to that time, seen any samples of hardened oils, or oils which had been hardened by hydrogenation?

A. I don't think so; I am not clear in my recollection.

Q. 12. Prior to that time had you had any correspondence with Crossfield & Sons, Limited, in reference to hydrogenated products?

A. If we had correspondence with Crossfield prior to that time I don't remember.

Q. 13. Have you preserved your correspondence with Crossfield & Sons, Limited?

A. The correspondence, I think, was conducted entirely by Mr. Burchenal. I may have written some letters, but I think it was practically entirely by Mr. Burchenal.

Q. 14. Were copies of that correspondence preserved?

A. I presume so.

Q. 15. And Mr. Burchenal would know about that?

A. Yes.

Q. 16. Did Mr. Kayser tell you of what the samples that he showed you were made?

A. I don't remember. He probably did; I don't remember

212 that.

Q. 17. Did he explain to you the process by which they were made.

A. No, he did not.

Q. 18. When did you first learn the process by which the hydrogenated oils were produced?

A. I can't tell you that either; I don't remember; quite some time, I think, we were some time negotiating with Mr. Kayser, all of which negotiations were carried on by Mr. Burchenal.

Q. 19. So that you did not actually learn the process which Mr. Kayser had until after you had made some kind of an agreement with Mr. Kayser respecting the processes and the product?

A. No, sir.

Q. 20. Was the preliminary agreement that you made with Mr. Kayser preserved?

A. I suppose so. I don't know.

Q. 21. Who would know about that?
A. Mr. Burchenal would know.
Q. 22. And he would know that to the exclusion of yourself?
A. How is that?
Q. 23. He would know that to the exclusion of yourself
A. I doubtless saw it and it probably has been filed away. I don't know whether it has been or not, but he would know.
Q. 24. You signed it as an officer of the Procter & Gamble Company?
A. That I don't remember.
Q. 25. Will you please describe the process of hydrogenizing oils to form hydrogenized products, as you learned it from Mr. Kayser?
A. I never learned it. I don't know it today—the details of it I don't know at all.
Q. 26. The negotiations with Mr. Kayser and the working out of Mr. Kayser's process and the product produced by Mr. Kayser, were under Mr. Burchenal's supervision?
A. Yes.
213 Q. 27. So that Mr. Burchenal learned from Mr. Kayser whatever there was necessary to be learned?
A. Yes.
Q. 28. You are acquainted, I take it, with Mr. Wallace E. McCaw?
A. Yes.
Q. 29. And it is of record that sometime in the early part of the year 1908, you called upon Mr. McCaw in New York? Do you remember that circumstance?
A. Make it a little more definite? I don't know just in connection with what fact?
Q. 30. Do you remember calling upon Mr. McCaw in New York and showing him a sample of hydrogenated cotton-seed oil sometime in the early part of 1908?
A. I remember showing him a sample of hydrogenated fat, whether in New York or elsewhere, I don't know.
Q. 31. Will you please relate the circumstances of that meeting with Mr. McCaw?
A. I don't know as I can relate the circumstances. We at that time were working with the idea of using it in connection with making a lard compound, had done some experimental work in a preliminary way in the laboratory, ourselves, and gave him this sample to show what could be done in a practical way, in producing a lard compound.
Q. 32. Just what did you say to Mr. McCaw?
A. I have not the slightest rememberance.
Q. 33. Did you tell him that you wanted him to make up some compound, using the hydrogenated fat, or hydrogenated oil?
A. That is probably what I told him; I don't remember.
Q. 34. Did you tell him how to mix the ingredients together to make the lard compound?
A. No; I don't remember that I did.
Q. 35. You did not tell him in what proportion to use the ingredients?

A. I did not. I merely arranged with McCaw to make
214 the practical experiment for us.

Q. 36. In other words, you told him you would send him some of the hydrogenated cotton-seed oil and you would like to have him make it up into a compound?

A. Yes; and any further instructions he probably got somewhere else.

Q. 37. Did he get any further instructions?

A. I don't know.

Q. 38. So that you left it entirely to Mr. McCaw to make up a compound when he received the hydrogenated fats?

A. I don't know as I did that even, Mr. May. I knew Mr. McCaw as the head of another business and I arranged with him to make such experiments as we wanted—that is about the size of it. The details of it were worked out by Mr. McCaw and other practical men.

Q. 39. Did Mr. McCaw receive any instructions as to what to do from any of your practical men?

A. I don't know.

Q. 40. Who would know about that?

A. Mr. McCaw would probably know, or Mr. Burchenal.

Q. 41. Did you have any correspondence with Mr. McCaw touching that matter?

A. I do not remember any.

Q. 42. Who would know about that?

A. Mr. McCaw. I doubt if there is any correspondence though.

Q. 43. Did you see Mr. McCaw again before he actually made the compound using the hydrogenated oils?

A. Probably I did, I don't remember anything in connection with hydrogenation; I used to see McCaw quite frequently in New York.

Q. 44. Why did you select Mr. McCaw as the one to make the compound from the hydrogenated oils?

A. He was one of the smaller manufacturers at that time and he knew—of course I didn't care to go to the American
215 Company, to the big companies; I had a good opinion of his ability and he was one of the smaller manufacturers.

Q. 45. He was a man who had been in the business of manufacturing lard substitutes from cotton-seed oil and oleostearine?

A. Yes.

Q. 46. You selected him as a man who knew his business?

A. Oh, yes; and there would not be such a risk in showing it to him, as taking it up, maybe, with the larger competitors.

Q. 47. Did you see any samples of the first compound which Mr. McCaw produced by mixing hardened cotton-seed oil with cotton-seed oil?

A. I undoubtedly did, but I don't remember any details at all about it.

Q. 48. You don't remember what it looked like?

A. No.

Q. 49. You did not yourself make any experiments?

A. Personally, no.
Q. 50. In any of these matters?
A. Personally, no.
Q. 51. Did you see any of these made?
A. Yes, I did; occasionally in the laboratory and in the plant.
Q. 52. Who made these experiments?
A. They were under the general supervision of Mr. Burchenal.
Q. 53. And that was prior to the time that you saw Mr. McCaw?
A. Both prior and afterward.
Q. 54. Do you know or remember any of the details in connection with the experiments to which you have referred?
A. I do not. No.
Q. 55. Do you remember in what proportions hardened hydrogenated fats were mixed with other ingredients?
A. I do not.
Q. 56. Who would know about that?
A. Probably Mr. Burchenal. Do you mean now in these
216 preliminary experiments, or with Mr. McCaw?
Q. 57. In the preliminary experiments?
A. Mr. Burchenal, probably.
Q. 58. Prior to your meeting with Mr. McCaw, had you seen any food in which such an experimental compound had been used as a shortening?
A. No; I had not.
Q. 59. Had you seen any food that had been fried or cooked in such an experimental shortening, or an experimental compound, which you say Mr. Burchenal made before you saw Mr. McCaw?
A. Why, I do not say Mr. Burchenal made experiments in compounds. He experimented, but why he made it I don't know.
Q. 60. So that you really do not know?
A. I really do not know.
Q. 61. What Mr. Burchenal did?
A. No; I don't know the details at all, Mr. May.
Q. 62. When was it that you decided to erect a large hydrogenating plant for the purposes of hydrogenizing cotton-seed oil and other oils?
A. Oh, shortly after we worked out our arrangements with Kayser. I don't remember the date.
Q. 63. Was it your purpose then to make hardened fat for soap making, or hardened fat for edible purposes?
A. Originally for soap making.
Q. 64. That was what you had in mind when you decided to go ahead and build a large hydrogenating plant?
A. Yes.
Q. 65. And that plant was started in operation according to Mr. Burchenal, about February 15, 1909? You recall that, do you?
A. I presume that is correct; I don't know; I don't know the correct date.
Q. 66. You recall, I take it, that the shipment of hardened cotton-seed oil was sent to Mr. McCaw after you had your first con-
217 versation with him?

A. Yes.

Q. 67. Do you remember when that was?

A. I do not.

Q. 68. Do you remember when the second shipment of hardened cotton-seed oil was sent to Mr. McCaw?

A. No, I do not.

Q. 69. Had you previous to Mr. Kayser's coming to this country, been interested in any way in the manufacture of lard substitutes?

A. No.

Q. 70. Up to that time the Procter & Gamble Company and none of its subsidiary companies had been interested in the manufacture of lard substitutes?

A. No.

Q. 71. Are you familiar with the technique of refining cotton-seed oil?

A. Oh, in a general way, I am. I have done that work years ago, but I a[illegible] not—oh, I have forgotten most of it.

Q. 72. You are familiar with the fact that crude cotton-seed oil was not edible, I take it?

A. Oh, of course it is not.

Q. 73. And that in order to make it edible it was necessary to subject it to various refining operations?

A. Yes.

Q. 74. At the time that Mr. Kayser first showed you the samples of the hardened cotton oil, were you familiar with the fact that lard substitutes were made by hardening or stiffening cotton-seed oil by mixing harder fats therewith?

A. Yes.

Q. 75. Were you familiar with the fact that prior to that time such lard substitutes had been made by adding to cotton-seed oil, such hardened fats as beef tallow, beef stearin, cotton-seed stearin and even at times paraffin?

A. I knew in a general way that lard compounds were made of cotton-seed oil and oleo stearin. I never knew paraffin was used in it.

218 Q. 76. Colonel Procter, do you recall when they first began the manufacture of lard substitutes at Ivorydale, using as an ingredient hardened cotton-seed oil?

A. I do not, Mr. May. I presume it was shortly after we bought the McCaw plant. It was started there first and at Ivorydale afterward. I don't remember the exact date.

Q. 77. Do you remember the trade name of the material which was manufactured at Ivorydale for that purpose?

A. I think it was "Flake White." That is my recollection.

Q. 78. Do you recall that "Flake White" consisted of cotton-seed oil, hardened cotton-seed oil and oleo stearin?

A. Yes.

Q. 79. And how long was it that they continued to manufacture that Flake White with those three ingredients?

A. I cannot tell you; some months; I can not tell you how long.

Q. 80. Probably some years, was it not?

A. Well, it may be; I don't remember, though, Mr. May; I don't remember the details at all, you see.

Q. 81. During that time you had an Inspector of the Bureau of Animal Industry at the plant, I take it?

A. Yes.

Q. 82. Why did you finally leave out the oleo stearin?

A. Let me see if I can recall the reason: It is my recollection that we found it necessary to begin to put in some, or thought so at least—until we got our process worked out better, that we required some oleo stearin in there. I can't say—I wouldn't want to be definite in that, but that is my recollection.

Q. 83. And finally you found it could be left out?

A. Yes.

Q. 84. Without changing the character of the product?

A. Yes.

219 Q. 85. Under what names, or under what trade names, were the lard substitutes sold by the Procter & Gamble Company prior to April 13, 1915, which is the date of issue of Letters Patent Number 1,135,935, in suit?

A. The Flake White, Invincible, and some little stuff sold under the name of Plantene.

Q. 86. My question was broad enough to include, Colonel Procter, any lard substitutes?

A. Well, if you refer to Crisco, we never grouped Crisco in the lard substitutes.

Q. 87. Yet Crisco, however, was a product made by hydrogenizing cotton-seed oil?

A. Yes.

Q. 88. When was that first put upon the market?

A. Oh, I don't remember dates—but we did—in 1911 or 1912——

Mr. Allen: May, 1911.

A. Was it? I have forgotten the date, Mr. May.

Mr. Allen: I can tell you that date; it was May, 1911.

A. I know it was about four or five years ago that we put the thing out. I don't remember exact dates.

Q. 89. Prior to that time had you seen any similar product which had bmeen produced experimentally, or otherwise, by any of the officers or employees of the Procter & Gamble Company, in which hydrogenized oil was used, without the addition of any other ingredients?

A. Do you refer again to Crisco or lard compound?

Q. 90. I am referring now particularly to Crisco?

A. I am referring to Crisco, not lard compound, yes. I saw samples experimentally out there from time to time.

220 Q. 91. How long before May, 1911, had you seen such samples?

A. I don't remember, Mr. May. Experimenting was going on there for quite a while; how long I can not tell you.

Q. 92. You did not keep actively in touch with it?

A. No; I didn't keep actively in touch with it. They would bring the experimental samples in; when they got something they thought was pretty good I would probably see it; I undoubtedly would, but I don't remember it.

Q. 93. But you don't know any of the details of that making of experiments?

A. No, I do not.

Q. 94. Anything more than it was just shown you as something interesting?

A. Well, it was shown to me to see if I finally thought it was worth going into; that was about the size of it.

Q. 95. How could you tell whether you thought it was worth going into or not?

A. How does the head of a concern determine anything, Mr. May? He takes the word of the man who produces it, he looks into it, hears from the salesmen and everybody else and makes his conclusion. It is not merely a chemical and manufacturing question, but it has a commercial side, too; all three have to be considered.

Q. 96. So you were concerned more particularly, I take it, with the commercial side?

A. Yes.

Q. 97. Rather than in the details of the manufacture of it?

A. Yes.

Q. 98. Or the exact nature of the composition?

A. Yes.

Q. 99. Now, between the time you first saw some hydrogenated cotton-seed oil, which was brought to this country by Mr. Kayser, and the starting of your commercial plant for the production of hardened oils, in February, 1909, had you had any communi-
221 cations or dealings with Crossfield & Sons, Limited, of England?

A. I told you, as I answered before, I don't remember whether it was before or after Kayser was here.

Q. 100. But so far as you now remember, the samples of hydrogenized oils which Mr. Kayser showed you, were the first productions that you had seen produced by hydrogenizing oil?

A. So far as I now remember, yes.

Q. 101. Do you know whether or not, in the manufacture of Flake-White Invincible and Plantene, either at Ivorydale or at Macon, Georgia, at the McCaw plant of the Procter & Gamble Company, the proportion of the oleo stearin in the compound was gradually lessened?

A. I don't remember.

Q. 102. Do you remember whether or not, in the early commercial manufacture of Crisco, any materials other than hardened cotton-seed oil were used in the making of the product, or in the product?

A. I don't remember. I think other products were used, also, portions of the time, but I would not be clear about that.

Q. 103. Who would know about that, Colonel Procter?

A. I presume Mr. Burchenal would.

Q. 104. He would know if any one would?

A. Yes, whether other oils had been used—I presume he would.

Q. 105. Do you know whether or not any difficulties arose because of the presence of nickel in any of the product manufactured by the Procter & Gamble Company in which hydrogenized oil was used?

A. I do not remember any instance being brought to my attention where trouble arose.

Q. 106. You did not have any correspondence with the Department of Agriculture or any officials in connection with such a matter?

A. No, I did not.

Q. 107. Do you know if there was any such correspondence?

A. I do not, really— Regarding the Procter & Gamble product?

Q. 108. Yes?

222 A. I do not. There was, about nickel in samples from other manufacturers, but I never heard about it coming up in connection with our own.

Q. 109. Who had charge of the advertising of the product of the Procter & Gamble Company, in which hydrogenized oil was employed?

A. Oh, I hardly know whether I am answering accurately or not —Mr. Rogan has charge of the advertising of Crisco, which is an hydrogenated oil, where hydrogenated oil is employed.

Q. 110. Does Mr. Rogan have charge of the advertising of these other lard substitutes, such as Flake-White, Invincible and Plantene, for the Procter & Gamble Company?

A. They are practically not advertised, Mr. May.

Q. 111. So that the advertising has been mainly of Crisco?

A. Yes.

Q. 112. How has that material been advertised, Colonel Procter?

Mr. Allen: That is objected to as entirely irrelevant and immaterial.

A. You mean, very extensively, or by magazines, or details of that sort?

Q. 113. I will put my question this way: Crisco has been advertised, has it not, by advertisements in the various national journals, such as the Ladies' Home Journal, and the various papers issued for women, and, in various other magazines which have a wide circulation, by demonstrators, by traveling men calling upon people who would be likely to be interested in such a product, and so forth?

A. Yes.

Mr. Allen: That question is objected to as irrelevant and immaterial.

223 Q. 114. And the cost of such advertising approximates three or four millions of dollars, does it not?

Mr. Allen: That is objected to as irrelevant and immaterial.

A. Oh, I don't know; it is in excess of a million dollars, I know that; but I wouldn't say what it is.

Q. 115. So that you have bent every effort for the commercial exploitation of this Crisco that can be employed by a successful manufacturing concern?

Mr. Allen: I object to that on the same grounds.

A. Yes, we have made a good many efforts.

Q. 116. Colonel Procter, can you tell me whether or not the Joslin-Schmidt concern is connected in any way with Procter & Gamble Company?

A. It is not a subsidiary company, no.

Q. 117. And you are not a stockholder of that Joslin-Schmidt Company, are you?

A. No.

Q. 118. Is there any working arrangement, or has there been any working arrangement, between the Procter & Gamble Company and the Joslin-Schmidt Company?

Mr. Allen: That is objected to as incompetent, irrelevant and immaterial.

A. You will have to define "working arrangement," Mr. May. We have had talks with The Joslin-Schmidt Company. I don't know what you call a working arrangement. There is no working arrangement—I will answer that question that way; but I do
224 not want to answer it in a misleading way; we have had talks with Joslin-Schmidt Company regarding our interest in the matter.

Q. 119. Has the Procter & Gamble Company purchased hardened or hydrogenized compound, or material, from Joslin-Schmidt?

A. Not in a large way. They may have purchased some at times; I don't know; I rather doubt it.

Q. 120. Is the Procter & Gamble Company interested in any other company which manufactures fats, which have been hydrogenized?

A. We are interested in the Hydrogenation Company, yes; we are interested in that.

Q. 121. Are you interested in the American Oil Treating & Hardening Company?

A. No.

Q. 122. When, to your knowledge, did Joslin-Schmidt first hydrogenize oils?

A. I don't know; I would have to look that up; I haven't any way of placing it at all. It was some time after we did it ourselves.

Q. 123. Some time as early as 1909?

A. I don't know.

Q. 124. You sent Mr. McCaw to England in the summer of 1909?

A. Yes—if that date is correct, we did.

Q. 125. Previous to that time had you had any talk or communication with Mr. George Crossfield touching these matters of hydrogenizing oils?

A. Yes.

Q. 126. In the United States?

A. Yes.

Q. 127. Mr. Crossfield called upon you in connection with the matter?

A. Yes.

Q. 128. And were there any references to the fact that Mr. Kayser, who was then in your employ, had previously been working for Crossfield & Sons, Limited?

A. I do not remember, Mr. May. Those conversations
225 with Mr. Crossfield were mainly had with Mr. Burchenal; I only came in on the end of them.

Q. 129. Putting the matter rather conservatively, I take it that Crossfield was "sore" that you had hired one of their men?

A. I don't know; I don't think I ever got to that point with him.

Q. 130. But you deemed it expedient to send Mr. McCaw to England to square matters with Crossfield & Sons, Limited, and to acquire whatever rights they might have in this country——

A. It was not necessary to do any "squaring" with Crossfield & Company; but we wanted to acquire whatever rights they might have in this country as to those matters.

Q. 131. Referring once more to the hardened oils which were sent to Mr. McCaw following your talk with him at which you showed him the sample of hardened cotton oil, did you tell Mr. McCaw how he should treat the compound as to the deodorization or otherwise?

A. I do not.

Q. 132. Did any one, for the Procter & Gamble Company, so far as you know?

A I do not know.

Q. 133. You said that you had seen the results of some experiments that had been made at the Procter & Gamble Company plant before you had your talk with Mr. McCaw?

A. No—I beg your pardon—experiments in what? I think that question referred to Crisco, not lard compound.

Q. 134. Then I will ask you this question: Prior to your first talk with Mr. McCaw had you seen any compound in which hydrogenized oil was used, which had been made by any one at the Procter & Gamble Company plant, experimentally or otherwise?

A. I do not remember definitely. I think probably I saw mix-
tures of hardened oils and cotton-seed oil, but not anything
226 approaching the commercial point.

Q. 135. That is to say, those mixtures had not been deodorized?

A. No; they had not been worked out, just simply experimental mixtures, getting started on the thing.

Q. 136. But nothing that could be used?

A. Nothing that could be used.

Q. 137. Commercially or practically?

A. No, I did not see any.

Q. 138. When did you first learn that hydrogenized cotton-seed oil was suitable for use as an edible product?

A. I don't remember. I do not know when.

Q. 139. When did you first learn that it could be so used?

A. I don't know. I cannot fix the exact date; about the time we were working out these experiments then in the lard compound.

Q. 140. At Macon, Georgia?

A. No, at Ivorydale.

Q. 141. That was about the time you made your commercial plant?

A. No, while we were working out experiments there, the experimental work; we started in to work out for an edible product, after we started on the plant at Ivorydale. I suppose we assumed it could be used for that purpose at that time, but we didn't develop it.

Q. 142. That is, you assumed the hydrogenated oil could be used for that purpose?

A. Made further experiments to see if it could be done, to develop it.

Q. 143. Who told you that hydrogenized cotton-seed oil could be used as a food product?

A. I do not remember.

(Signed) WM. COOPER PROCTER.

Attest:

B. E. DILLEY.

227 At this point a recess was taken to 1:30 o'clock in the afternoon of the same day, Thursday, October 19, 1916, at which time the hearing was resumed, with counsel present as heretofore noted.

JOHN J. BURCHENAL, a witness produced in behalf of the defendant, having been first duly sworn, deposes and says as follows, in answer to interrogatories:

By Mr. May:

Q. 871. You are the same John J. Burchenal who appeared and testified in the case of the Procter & Gamble Company vs. Berlin Mills Company, as indicated by the deposition which has been stipulated into this record.

A. I am.

Q. 872. And you were subpœnæd to testify in this present case?

A. I was.

Q. 873. Referring again to the time when Mr. Kayser came to this country in the last of November, 1907, were the samples of hydrogenated oils that he showed you the first that you had ever seen of hydrogenated oils?

A. I do not recall.

Q. 874. Where if at all had you seen any hydrogenated oil products, prior to that time, and whose products were they?

A. If I had seen any at all, of which I am not certain, they must have been samples furnished by Joseph Crossfield & Sons, Limited. If I had ever seen any samples other than those, I would not have recognized them as such.

Q. 875. That is to say, if you had, previous to seeing the samples

brought by Mr. Kayser, seen any hardened oil products, you
228 would not have known whether they were produced by hydrogenation or not?

A. Yes, unless—— No; I would not have known any such.

Q. 876. So that at the time you first saw those hydrogenated oil products that Mr. Kayser brought with him, it was the first time that you had seen any products which you knew, or were told, had been produced by a process of hydrogenizing oils?

A. That is my impression.

Q. 877. And that is your recollection?

A. That is my recollection.

Q. 878. At the time when Mr. Kayser first showed you those samples of hydrogenized oils, did he then tell you that they had been produced by a process of hydrogenation, or was it at some later interview that you obtained that information?

A. Well, I do not recall.

Q. 879. You testified that you first made with Mr. Kayser some form of preliminary agreement; had you been advised by Mr. Kayser prior to the drawing of this agreement that those samples that he showed you were made by hydrogenizing oils?

A. I think so.

Q. 880. But prior to the execution of that preliminary agreement, had Mr. Kayser told you in a general way what the process was of producing those hydrogenized oil products?

A. I do not recall that.

Q. 881. Would it enable you to refresh your recollection on that point if you should read that preliminary contract that was made with Mr. Kayser?

A. I don't know that it would. The reason for the doubt in my mind was, that Mr. Kayser was very mysterious about the thing, and his information was disclosed in a number of interviews, and
229 I can not recall just where or when the information was disclosed to me. It is my recollection that Mr. Kayser told us —and he must have told us—and all his conversation at that time was with me, of a process that he had; and we came to some sort of an agreement for a compensation to Mr. Kayser, for the disclosing of his process. Will that give you the information you desire?

Q. 882. I will tell you frankly what I had in my mind, Mr. Burchenal: I am trying to find out how soon it was that you learned that that product, or the sample, which Mr. Kayser had with him, had been made by a process of hydrogenizing oils—and I am trying to carry your mind back to that time, so as to enable you to state with as much accuracy as possible, just when it was that you obtained that information?

A. Our interviews covered, as I have said before, our interviews were numerous, and covered several days before any sort of an agreement was reached, and during that time he disclosed his methods, or at least to the extent that he told us he was able to harden this material, showing the samples, hardening it, as shown by those samples, by a process of hydrogenation.

Q. 883. Will you be good enough to look up that preliminary

agreement and give me the date of it? I do not care to know anything about your business relations with Mr. Kayser, and the purpose of my inquiry is not into that at all?

A. I would be very glad to do so,

Q. If you will, I would like to inspect that original agreement and I will hand it back to you?

A. I don't see any objection to that, under those circumstances; but I will consider it more fully, after I have seen the agreement.

230 Q. 885. Now, when did the question of the edibility of this hardened cotton-seed oil arise? You said that you spoke to Mr. Kayser about the possible edibility of these products, and I am trying to get at the time when that question arose?

A. That was in one of our earliest interviews. I asked him if the material would be suitable for edible purposes.

Q. 886. Did you recognize it at that time as being suited for edible purposes?

A. I recognized the possibility of it.

Q. 887. But you did not know, as a matter of fact, whether it would be edible or not?

A. I did not. Mr. Kayser stated that it would not be—but that was his method of talking.

Q. 888. At the time when you spoke to him about it, you did not know whether it would be or would not be?

A. I did not know.

Q. 889. When was it that you made up your mind that it was suitable for edible purposes?

A. As soon as I saw the material that he brought there, I made up my mind that I would endeavor to ascertain if it was edible. I went into the thing, I examined the material; we worked on that; I could see no reason why it should not be edible.

Q. 890. How was it that you came to that conclusion?

A. Well, the conclusion that I came to was, the manner in which I came to that conclusion was, that, by taking an edible material in the first place, and removing anything from it that would make it inedible, there was a strong probability that it could be used for that purpose.

Q. 891. Did you recognize at that time that something would have to be done to hydrogenize cotton-seed oil in order to

231 make it suitable for edible purposes?

A. I don't believe I understand just what you mean? Cottonseed oil is edible.

Q. 892. Well, was there anything about this product which Kayser had brought with him, which made it inedible?

A. Well, he seemed to be under the impression that they were inedible, and the material itself didn't look like an edible material.

Q. 893. But was there anything inherent to this product which he brought with him, which rendered it inedible?

A. Nothing, I should think, except the fact that the idea of edibility had not been associated with it.

Q. 894. I suppose much in the same way as the idea of edibility had not been associated with tomatoes in the early days?

A. Well, that I don't know.

Q. 895. Now, when the first experiments were made with hardened cotton-seed oil by compounding it with other cotton-seed oil, what did you do to the product, other than mixing the ingredients together?

A. I don't recall that we did anything beyond the mixing of the oil.

Q. 896. You did not deodorize the mixture?

A. No, sir.

Q. 897. Or treat it with Fuller's Earth?

A. I do not recall about that. The oil probably was treated, probably filtered with Fuller's Earth, like all oil is.

Q. 898. That was before you compounded the ingredients together, however?

A. Yes.

Q. 899. Had the hydrogenated oil, previous to compounding the ingredients, been subjected to any deodorization of Fuller's Earth treatment?

A. I am not sure about that. I do not think, as I recall it, that it was deodorized at all, and I do not believe it was filtered with Fuller's Earth.

232 Q. 900. Who actually did the mixing of these ingredients, to wit, the cotton-seed oil and the hydrogenized cotton-seed oil?

A. I did some of them; I don't recall who did the others.

Q. 901. What did you do with the compound after you made it?

A. Oh, just small samples; they were mixed for my observation.

Q. 902. But you did not attempt to use them for cooking purposes?

A. No, I don't recall that we did.

Q. 903. In what proportions did you first mix the two ingredients, to wit, the cotton-seed oil and the hardened or hydrogenated cotton-seed oil?

A. I do not recall that. Of course there were a number of experiments made.

Q. 904. Were the proportions determined empirically?

A. I think the original mixture must have been based—must have been based on our knowledge of the hardness of the material.

Q. 905. That is to say, you knew the titer of the cotton-seed oil and you knew the titer of the hydrogenized cotton-seed oil, and you knew the titer of the ordinary lard substitutes composed of cotton-seed oil and oleo stearine, and knowing these titers, you mixed the materials together so that when mixed they would have approximately the titer of the ordinary lard substitute?

A. Well, in a general way, we were led by that, but our experiments were not confined just to that one thing.

Q. 906. How long was it before Mr. Procter saw Mr. McCaw and showed him the sample of the hardened cotton-seed oil, that these experiments had been made?

A. I don't know.

Q. 907. Mr. McCaw said that it was his recollection that Mr. Procter saw him the latter part of February, or early part of
233 March, 1908. Can you fix how long before that time it was that the first experiments were made?

A. No; I cannot.

Q. 908. Were no records kept of those mixtures?

A. No; there would be no occasion for it.

Q. 909. Where were those mixtures made,—at your home, or at the plant?

A. At the plant.

Q. 910. Was anyone present when those materials were compounded together, besides yourself?

A. Very likely, but I do not recall, because the experiments themselves only remain in my mind from the fact that I made the experiments.

Q. 911. After you looked at the mixtures, they were presumably destroyed, without being used for cooking, or any other purpose?

A. I don't know of any reason——

Q. 912. So that they were presumabiy destroyed without being used for cooking purposes?

A. I don't think that any of them were used for cooking purposes. I never heard of it.

Q. 913. Prior to the time that the Procter & Gamble Company sent to Mr. McCaw the first shipment of the hydrogenized oil, in May, 1908, had you, or anyone else of the Procter & Gamble Company, so far as you know, produced any product, experimentally or otherwise, containing hydrogenized cotton-seed oil, which was used for cooking or edible purposes?

A. I do not think so; I do not recall of any being used for cooking purposes.

Q. 914. Prior to the actual shipment of that hardened cotton-seed oil to Mr. McCaw, had you personally talked to Mr. McCaw about the matter of the compound?

A. That is my recollection. I think I did.

Q. 915. Did you tell him in what proportions to mix the hardened or hydrogenized cotton-seed oil with the cotton-seed oil, in making up the compound?

234 A. I do not recall whether I told him, or whether somebody else told him.

Q. 916. Do you recall that anybody told him?

A. My recollection is that he was given instructions on that point.

Q. 917. That he was told in what proportions to mix the two ingredients together?

A. That is my recollection.

Q. 918. But you do not recall having told him so yourself?

A. I do not recall having told him so myself. I recall some conversations—the fact that we had conversations, but the details I cannot recall.

Q. 919. Did you have any correspondence with Mr. McCaw touching the procedure which he should follow in making up the compound?

A. I am not certain about that.

Q. 920. What is your recollection about it?

A. My impression is that there was some correspondence with Mr. McCaw.

Q. 921. Do you remember whether that was prior or subsequent to the making of the first compound by him?

A. No; I am not certain whether the instructions were given to Mr. McCaw verbally or by letter.

Q. 922. But if any instructions were given, you did not give them?

A. That I do not recall.

Q. 923. Did the product that Mr. Kayser first made when he carried on his process at Ivorydale, have the same general appearance as the samples which he brought over with him and showed to you?

A. I think so; it is my recollection that it did.

Q. 924. After the Procter & Gamble Company produced the material—or after the Procter & Gamble Company purchased the compound plant of the McCaw Manufacturing Company and
235 started the manufacture of compound at Macon, Georgia, including in its composition hydrogenized cotton-seed oil, oleostearin and cotton-seed oil, in which the roportion of the oleostearin to the hardened cotton-seed oil was three to one, as stated by Mr. McCaw, how long did the Procter & Gamble Company continue to manufacture this compound with approximately those same proportions of ingredients?

A. I do not know.

Q. 925. Well, was it for some considerable length of time?

A. I really do not know. I did not recall those proportions.

Q. 926. But you did know that the oleostearin was included in the mixture?

A. Yes.

Q. 927. And when the Procter & Gamble Company first made the lard substitute at Ivorydale by compounding together cotton-seed oil and hydrogenized oil, they included oleostearin in the mixture, did they not?

A. Yes.

Q. 928. Do you remember in what proportion the oleostearin and the hydrogenated cotton-seed oils were used?

A. No; I do not.

Q. 929. What led the Procter & Gamble Company to eliminate the oleostearine from the compound?

A. My recollection of the matter is, that the oleostearin was kept in the compound for some time, to comply with the formula that we had on our packages, and to allow of a Government Meat Inspector at our plant.

Q. 930. In order to get the benefit of the notice of the inspection on the labels?

A. We wanted to get that. There was another point there, however, I think that we also had in mind, and that was the fact that we did not care about having the compound appear as something that was different from the ordinary commercial compound.

236 Q. 931. So that when you switched from the mixture of the oleo compound to the compound using only hydrogenized oil, you did not want the public to know the difference?

A. Well, not that. We did not know what idea might be raised in the mind of consumers as to something they might think was different.

Q. 932. But in point of fact, the consumers never did notice the difference, so far as you know, between those compounds?

A. I don't know that I have any information on that subject at all.

Q. 933. Those compounds at Ivorydale were sold under the names of "Flake White," "Invincible" and "Plantene," were they not?

A. I don't remember whether we ever made "Plantene" at Ivorydale, but we made "Flake White" and "Invincible."

Q. 934. In the manufacture of these two compounds, "Flake White" and "Invincible," was the proportion of oleastearin gradually diminished?

A. I do not recall that it was gradually diminished.

Q. 935. Then so far as you recall, the proportions of the ingredients were maintained until the time came when you left out the oleostearin altogether?

A. I am not certain about that. It is possible that at first there we might have used a larger percentage of oleostearin—I am not certain about that.

Q. 936. Who would know about that, Mr. Burchenal?

A. I should think Mr. Anderson would know. Probably he might not recall it, but he might look it up.

Q. 937. After Mr. McCaw made, at Macon, Georgia, this "Flake White," by using the carload shipment of hardened cotton-seed oil which you sent to him, after you got your commercial plant

237 running, on February 15, 1909, was that compound then placed on the market immediately?

A. I think it was; I am not sure.

Q. 938. Were any samples of that compound sent to you before he was told to put it on the market?

A. As I recall, they sent the samples immediately.

Q. 939. What was done with those samples?

A. I do not know.

Q. 940. You did not do anything with them, did you?

A. Not that I recall. They were probably tested.

Q. 941. Have you personally ever conducted any cooking tests with any of the materials containing the hydrogenized oils, which were produced, say, up to January 1, 1910?

A. I have supervised a great many tests.

Q. 942. When did these cooking tests begin?

A. With "Flake White"?

Q. 943. Or with any of the other products containing hydrogenized oil?

A. I do not recall.

Q. 944. Were they before Mr. McCaw put on the market the first

compounds that were manufactured from the large shipment of hydrogenized oil, immediately after February 15, 1909?

A. It might have been—I do not recall any.

Q. 945. Who would know about that?

A. I don't know.

Q. 946. When the Procter & Gamble Company sent the first lot of hydrogenized oil to Mr. McCaw, in May, 1908, were you familiar with the methods of deodorization which were practiced by compound makers, manufacturing lard substitutes of cotton-seed oil and animal oleostearin?

A. I was familiar with the methods of deodorization, in a general way.

Q. 947. But you were not familiar at that time with the
238 methods practiced by compound makers in making their compounds of cotton-seed oil and oleo stearin?

A. I assume they were very much the same.

Q. 948. But you really did not know, as a matter of fact?

A. No.

Q. 949. Did you know what was the practice of Mr. McCaw, or the McCaw Manufacturing Company, in manufacturing the lard substitutes, other than the fact that the oleostearin and the oils were mixed together?

A. No; I did not know the methods practiced by the McCaw Manufacturing Company. I know that deodorization is conducted under the same general principles—must be—whether it is a lard compound manufacturer, or whether it is an oil refiner.

Q. 950. What was the usual method of refining cotton-seed oil then in vogue?

A. The usual method of refining cotton-seed oil was the precipitation of the impurities and the free fatty acids, with the addition of a caustic alkali—caustic soda.

Q. 951. And that treatment caused the saponification of the free fatty acids and caused the removal of some of the coloring matter and impurities?

A. Yes.

Q. 952. And as a further step in the treatment of the oil it was subjected to deodorization?

A. Subjected to filtration with Fuller's Earth, and where the oils were of such a character that they were improved by deodorization, they were deodorized where it was necessary.

Q. 953. What was the method of deodorization?

A. In a general way, the passing of steam through the oil, carrying off the volatile matters there that affected the flavor and odor of the oil.

239 Q. 954. That was done by the use of superheated steam?

A. I think generally superheated steam, yet I don't know that that would necessarily be the case; I think that is preferable.

Q. 955. These processes of saponification of the free fatty acids, removing more or less of the impurities and deodorizing the oil with superheated steam produce what is known as refined cotton-seed oil?

A. Filtering with Fuller's Earth, also.

Q. 956. And the cotton oil thus produced was known as yellow cotton oil?

A. Except where the oil was bleachable, in which case sufficient Fuller's Earth was put in to bleach the oil; in that case it was white oil.

Q. 957. In that case it would be called "Summer White Oil"?

A. Yes.

Q. 958. For the production of what was known as "Winter Oil," what further step was necessary?

A. In that case the oil was chilled and the stearin was removed by filtration.

Q. 959. The lighter oil was expressed, leaving behind the more solid cotton stearin?

A. Yes.

Q. 960. Did you, in 1907, at the time when you first saw Mr. Kayser, know that this cotton oil stearin had been used and was being used in the manufacture of lard substitutes?

A. I might have known it. As a matter of fact, I don't think it was ever used very largely in lard substitutes.

Q. 961. But it was used to some extent in the manufacture of the lard substitutes in which cotton-seed oil was hardened by the addition of this cotton oil stearin?

A. I am not sure that I knew that. I don't think it was used very extensively, or ever has been used very extensively for that purpose. As a matter of fact, the stearin is a very soft material.

240 Q. 962. In the manufacture of lard substitutes, such as Flake White and Invincible, is there any variation in the proportions of hardening material in accordance with the part of the country to which the substitute is to be sent?

A. It seems to me that at one time an effort was made to do that by us; but I don't think any attention is paid to that now.

Q. 963. That is, where the substitute was to be sent to a cold climate, say, for instance, Saint Paul, Minnesota, you would put in less of the hardening material in the compound, than where the compound was to be sent, say to Texas?

A. I have an impression that some effort, at one time, was made to do that; but I don't think anything of the kind is done now.

Q. 964. You are referring in your last answer to the practice of the Procter & Gamble Company, of course?

A. Yes, only.

Q. 965. In the manufacture of these compounds referred to in the previous question, were there any variations in the amounts of the hardening material used in the compound, in accordance with the season? That is, winter or summer?

A. As I recall it, a difference was made in the summer and winter hardness of the material.

Q. 966. So that in summer time you added a greater proportion of the harder ingredients, and in winter time you added a smaller proportion?

A. That is my recollection; and I think that is the general practice in the trade.

Q. 967. You testified that you thought a sample of the first com-

pound which Mr. McCaw produced, when he was sent, some time in the early part of May, 1908, a shipment of the hydrogenized oil which Mr. Kayser had produced, was sent to Proctor & Gamble
241 Company and that you had seen it?

A. That was my recollection.

Q. 968. Now, how did that sample differ from the sample which Mr. McCaw sent you after he received the large shipment of hardened cotton seed oil in February or March, 1909?

A. My recollection on that is not perfectly clear . My recollection of the sample which Mr. McCaw sent us first, from the experimental lot, was, that it had a stringy appearance.

Q. 969. That stringy appearance was due to the chilling of the product, was it not?

A. That is not my impression.

Q. 970. To what did you think it was due?

Mr. Allen: The question is objected to as incompetent, irrelevant and immaterial.

A. My recollection is that I did not know to what it was due, but it had a stringy or a sticky look to it. My recollection of the compound that was sent to us afterward, was, that it looked fairly well, though I was not a judge of the material, not having had any experience.

Q. 971. The appearance of a lard substitute comprising cotton-seed oil and a hardening or stiffening material, depends very largely, does it not, upon the way it is chilled and the way it is beaten?

A. I should think, if you take a material in the first place that is suitable for the manufacture of compound, that its appearance would depend very largely upon the manner in which it is chilled and handled in the rolls.

Q. 972. Was there any difference between the hydrogenized oil which was sent to Mr. McCaw in the early part of May, 1908, and the hydrogenized oil which was sent him after you first started
242 the commercial plant in operation in February, 1909?

A. I don't think there was any material difference in the manufacture of the compound.

Q. 973. That is to say, those two hydrogenized products were substantially the same?

A. Substantially the same.

Q. 974. Do you know whether there was any difference at all between them?

A. I could not tell. I don't think there was any material difference.

Q. 975. Was one any harder than the other?

A. I don't know, but I don't think there was any material difference in the hardness. Our effort was to harden the material as hard as we could, I think, in both cases. That is what must have been sent.

Q. 976. In the notes which you produced and which were read on the record, in answer to question 851, there is one marked, "E-12," entitled "Analysis of Saturated cotton-seed oil." Is that an analysis of the hardened oil which you say was sent to McCaw in May, 1908?

A. I see this note on here says, "Sent Mr. W. E. McCaw, Macon, Georgia, May 7, 1908," and I assume that was the time that was sent Mr. McCaw.

Q. 977. I noticed that that note makes reference to "Fatty acids." Did that data refer strictly to the "Fatty acids," or glycerids of the fatty acids which comprise the hardened material which was sent Mr. McCaw?

A. I do not know; I assume it is the fatty acids.

Q. 978. In these same notes, and particularly the one marked "E-9," dated February 6, 1908, I notice that the titre is given of "Prime tallow," and also two mixtures of tallow and hard cotton-seed oil. I also note that these mixtures are given numbers. Does that indicate there were a number of mixtures made, from zero up to number 116?

243 A. I don't thnk so; but I don't know what that means.

Q. 979. Do you know what those mixtures of tallow and hard cotton-seed oil were used for, if anything?

A. No, sir; no.

Q. 980. Do you know anything about the significance of that note whatever?

A. I don't know anything about the significance of it.

Q. 981. That was not anything with which you had to do?

A. I might have had something to do with it, probably had, but I don't recall it.

Q. 982. That was some of Mr. Kayser's work?

A. It was a report of Mr. Kayser's.

Q. 983. These reports then all have to do with products that were produced by Mr. Kayser himself in carrying out his process?

A. Well, I don't know that that particular test had anything to do with this process.

Q. 984. But these notes all relate to products of Mr. Kayser?

A. Yes.

Q. 985. And you had nothing to do with the production of these products by Mr. Kayser which are referred to in these notes?

A. I cannot say I had nothing to do with them. I had a good deal to do with them.

Q. 986. What I mean is, you were interested in the work that Mr. Kayser was doing and he was reporting to you and to Mr. Anderson, from day to day?

A. Yes.

Q. 987. But other than that, you did not direct Mr. Kayser to make these particular products, did you?

A. Oh, I think, taking this particular case, that experiment was probably made at some suggestion to Mr. Kayser, but I do not remember.

Q. 988. But so far as you know, these products were produced by Mr. Kayser of his own motion, as it were, of his own

244 initiative?

A. No; I would not go so far as to say that. Mr. Kayser was making experiments there to demonstrate his process.

Q. 989. And these were products that he produced in that demonstration?

A. This particular mixture was made to give us some information on some particular subject.

Q. 990. That is to say, the particular material referred to in the note marked, "E-9," dated February 6, 1908?

A. That would be my surmise.

Q. 991. But the product referred to in the other notes were products Mr. Kayser produced of his own motion, or of his own initiative, in demonstrating his process?

A. In a general way, experiments were suggested to Mr. Kayser.

Q. 992. What experiments, for example?

A. I remember one experiment that we have here; it is about the pressure; "E-11." Mr. Kayser was under the impression that the difference in pressure there would have a value.

Mr. Allen: Pressure of hydrogen, you mean?

A. Pressure of hydrogen; so we had an experiment conducted on the pressure of hydrogen. These mixtures of tallow, I should just guess, that those were experiments made for the purpose of finding some soap-making material; it is only a guess in this case. As a matter of fact at that time Mr. Kayser's real interest was centered in the production of a catalyst. He had no question about being able to make a hard fat, when his catalyzer was right.

Q. 993. And he knew he could make a fat of any consistency he wanted, if his catalyst was right?

A. I suppose so.

245 Q. 994. And he simply demonstrated that he could do that?

A. No; he never demonstrated it. I don't know that he ever thought anything about it.

At this point an adjournment was taken to 9:30 o'clock in the morning of the following day, Friday, October 20, 1916, at which time the taking of these depositions was resumed as follows:

Morning Session, Friday, October 20, 1916.

The taking of these depositions was resumed pursuant to adjournment; counsel present as heretofore noted.

Mr. May: I offer in evidence copies of United States Letters Patent to Edwin Cuno Kayser, No. 1,004,035, dated September 26, 1911, for "Method of Saturating Fatty Acids or their Glycerids with Hydrogen," and No. 1,008,474, dated November 14, 1911, for "Method of Saturating Fatty Acids or their Glycerids with Hydrogen," and ask that the same be marked respectively, "Defendant's Exhibit Kayser Patent No. 1,004,035," and "Defendant's Exhibit Kayser Patent No. 1,008,474," together with this date and the initials of the Magistrate.

Counsel for the plaintiff object to the above exhibits as irrelevant and immaterial.

Mr. May: I further offer in evidence copies of United States Letters Patent to John J. Burchenal, No. 1,135,351, for Food Product, dated April 13, 1915, and ask that the same be marked "Defendant's Exhibit Burchenal Patent No. 1,135,351," together with this date and the initials of the Magistrate.

246

Counsel for the plaintiff objects to the above exhibit as irrelevant and immaterial.

Thereupon JOHN J. BURCHENAL resumed the stand and was further examined as follows:

By Mr. May:

Q. 995. You are the same John J. Burchenal to whom, as assignor to the Procter & Gamble Company, was issued United States Letters Patent No. 1,135,935, dated April 13, 1915, are you not?

A. Yes.

Q. 996. In Question 889, I asked you when you made up your mind that the hardened cotton-seed oil was edible, and I think that you did not in your answer state the time. Will you be good enough to now state when it was that you made up your mind that such hydrogenized cotton-seed oil was suitable for edible purposes?

Mr. Allen: That is objected to as irrelevant and incompetent.

A. I can't say when I made up my mind.

Q. 997. You mean you do not remember?

A. I don't remember. It was a process of arriving at that conclusion.

Q. 998. You mean a mental process?

A. Well, a mental process based upon observation of the material.

Q. 999. How long did you observe the material before you made up your mind that it was suitable for edible purposes?

247

Question objected to as irrelevant and incompetent.

A. Oh, I think it was probably some time before I reached any definite conclusion upon it. The thing suggested itself to me very early in our work, as a possibility.

Q. 1000. That is, it occurred to you that it might be possible to use this hardened cotton-seed oil in place of the usual stiffening agents that were employed in the manufacture of lard substitutes?

Question objected to as incompetent and irrelevant.

A. Yes. You see, I was not altogether familiar with the manufacture of the compound. Here was a material that had not been suggested to anyone as an edible product, as far as I knew; and to take up a material that had that particular feeling against it, apply it to

something that you were not altogether familiar with—was a more or less slow process.

Q. 1001. Is animal oleo stearin edible?

A. I don't know. I presume it is, but I am not certain—as such.

Q. 1002. How about beef tallow, as such?

A. I should think so, and I am very sure it is, if it is of an edible grade.

Q. 1003. What would you say as to mutton tallow?

A. I should think that it would be, certainly to some extent. I don't know; I don't know how those materials are, as taken by themselves.

248 Q. 1004. How about oleic acid, is that edible?

A. I should think not, though it might be; I do not know.

Q. 1005. Is it your opinion that any animal or vegetable fatty acid, or the glycerids of any vegetable or animal fatty acids, when hydrogenized, are suitable for use as an edible product?

Question objected to as incompetent, irrelevant and immaterial.

A. I should not think *any* such material would necessarily be edible.

Q. 1006. I notice that in the first paragraph of the Letters Patent No. 1,135,935, upon which this suit is brought, you say, in effect, that this food compound consists of a mixture of *an* oil and a hardening agent produced by hydrogenating *an* oil or liquid fat. (Italics mine.) Is it true that a food compound closely simulating lard in its physical and chemical characteristics may be made by a mixture of any oil and a hardening agent produced by hydrogenating *any* oil or liquid fat?

Question objected to as incompetent, irrelevant and immaterial.

A. I should hardly think so.

Q. 1007. In point of fact you know that it cannot be so produced, do you not?

Question objected to as incompetent, irrelevant and immaterial.

A. I should not think it could.

249 Q. 1008. Suppose, for instance, that the oil referred to is crude cotton-seed oil——

A. Or crude petroleum.

Q. 1009. That is not a vegetable—that is not an animal oil?—I got sidetracked in my question, so I will start over again: Suppose that the mixture consists of crude cotton-seed oil and a hardening agent produced by hydrogenizing crude cotton oil, would such a mixture closely simulate lard in its physical and chemical characteristics?

Question objected to as irrelevant, immaterial and incompetent.

A. I should hardly think so.

Q. 1010. It would not be edible, would it?

A. I should not think so.

Q. 1011. Would a mixture consisting of 85 per cent. of refined cotton-seed oil and 15 per cent. of hydrogenized refined cotton-seed oil, require any further treatment to make it closely simulate lard in its physical and chemical characteristics?

Above question is objected to as incompetent, irrelevant and immaterial.

A. I should think it would have to have the usual treatment for making lard, or lard compound.

Q. 1012. But would such a product, without that after-treatment, be edible?

Question objected to as incompetent, irrelevant and immaterial.

A. If a material is edible to start with, I should think so.

250 Q. 1013. But without that after-treatment, it would not be "lard-like in its consistency," would it?

Question objected to as incompetent, irrelevant and immaterial.

A. It would not be lard-like in its consistency; it would not be like commercial lard, or commercial compound, which goes through the treatment you have spoken of, the usual treatment for chilling and handling lard. The manufacture of lard in some localities, requires a different treatment from other localities. Lard that is sent into Cuba is all grain lard; so it is with the lard compound that we have sent into Cuba; it is not run over a chilling-roll at all. It is allowed to grain in the barrel, just as lard is, yet both of those materials are lard-like, but not "lard-like in consistency" in the sense of the material we are accustomed to in this locality, which has all been treated with these chilling-rolls.

Q. 1014. Would you regard such a grainy lard as you have just described as a homogeneous product?

Mr. Allen. The question is objected to a incompetent, irrelevant and immaterial, and attention is called to the fact that the word "homogeneous" is not used in the patent in suit.

A. It seems to me, in the sense that the word "homogeneous" would be used, whether it was taken as referring to the actual construction of the material, or its appearance, its physical condition, I would think that the graining of the material would refer to its physical structure—might or might not be homogeneous.

251 Q. 1015. To what do you understand the graining of the lard, under the conditions to which you have referred, to be due?

Question objected to as incompetent, irrelevant and immaterial.

A. The graining of the lard, as I understand it, is the solidifying of the harder portion of the lard and a separation into grains, instead of, where the material is ordinarily chilled, it is kept in a uniform—not uniform, exactly,—yes, probably uniform, it is kept in a uniform and consistent body throughout.

Q. 1016. Will you let me put you another question which will perhaps explain the phenomena: Is it not substantially like this,—that where the material is permitted to cool relatively slowly, the harder glycerids, such as the saturated glycerids, start to crystallize, and these crystals increase by the addition of other small crystals until you get fairly sizable grains; on the other hand, where the hot oily matter is chilled very rapidly, the grains are not permitted to form, as such, but the tiny crystals of the saturated glycerids are distributed evenly throughout the mass. Is that as you understand it?

Question objected to as irrelevant, incompetent and immaterial.

A. I thing substantially so; I think very likely this may be the case.

Q. 1017. Mr. Burchenal, have you looked at that preliminary agreement with Mr. Kayser, about which I asked you yesterday?

A. I have.

252 Q. 1018. What was the date of that?

A. The date of that was December 5, 1907.

Q. 1019. And was there anything in that agreement that related particularly to the products to be produced by Mr. Kayser, or the precise methods of producing the hardened material?

A. Reference was made to the materials to be produced by Mr. Kayser, but no refernce was made to the precise method.

Q. 1020. How were the products to be produced by Mr. Kayser characterized?

A. Hardened.

Q. 1021. And no other description of them given, or the use to which they should be put?

A. I think not.

Q. 1022. Now, having refreshed your recollection as to the date when this agreement was made, by examining it, are you able to say whether or not it was prior to the date of this agreement, or subsequent thereto, that Mr. Kayser explained to you that this material that he showed you was produced by the process of hydrogenization?

A. I do not recall; but judging from the wording of the agrement, I suspect, or I believe, that the explanation of the process, that the material should be hardened by hydrogen, was subsequent to this. The date that I find on the agreement is earlier than I had thought it was.

Q. 1023. Now, Mr. Burchenal, I am going to ask you to do something else: I would like to have you examine the records of the Procter & Gamble Company and produce such correspondence or communications as you find, between Mr. McCaw and Mr. Procter, or yourself, or the Procter & Gamble Company, or any of the officials or employees thereof, relating to the hardened cotton-seed oil which was sent to Mr. McCaw, or the McCaw Manufacturing Com-

253 pany, in 1908, and the products, or the mixtures or the compounds that were made by Mr. McCaw, in using that hardened cotton-seed oil? Will you be good enough to do that?

A. Let me understand the question: You want us to produce the correspondence that has been carried on between the Procter & Gamble Company, or anybody connected with the Procter & Gamble Company, and Mr. McCaw, regarding the hardened material that was sent to Mr. McCaw and the products that were made by Mr. McCaw, or the McCaw Manufacturing Company, in 1908?

Q. 1024. Yes; relating in any way to that which was sent or to be sent, and its disposition or use, and the product or compound or mixtures that were made by Mr. McCaw using that hardened cotton-seed oil? I want to add to my question that I am not concerned with any correspondence that might have been had with Mr. McCaw relating to the purchase of his plant, or the price which Mr. McCaw or his company should receive, or matters of that kind. I do not mean to inquire into your business relations with Mr. McCaw at all, but simply to get the other correspondence to which I referred in my previous question.

A. I will have a search made for any such correspondence, and if any such is found, will submit it to our counsel, and under his instructions we will supply that.

Q. 1025. Referring now to the sample of the mixture that Mr. McCaw made, using the hydrogenized cotton-seed oil which was sent him in the early part of May, 1908, which sample you said you thought you saw,—was that sample edible?

A. I presume it was.

Q. 1026. That is, you regarded it as an edible fat product?

254 Above question is objected to as incompetent and irrelevant.

A. I do not recall any tests being made on it; I merely presume that it was.

Q. 1027. So far as the edibility of it was concerned, however, you were satisfied that it was edible?

Above question is objected to as incompetent and irrelevant.

A. There was no question raised in my mind as to its being edible.

Q. 1028. I show you a certified copy of the Declaration of Interference dated January 3, 1913, in the matter of the Interference of Ellis vs. Boyce vs. Burchenal, No. 35,642, in which your application Serial No. 591,721, which subsequently eventuated into Letters Patent No. 1,135,935, was involved, and in which it appeared that the issues were as follows:

"Count 1:

An edible oil product comprising hydrogenated cotton-seed oil and edible oily material blending therewith."

"Count 2:

An edible oil product of lard-like consistency comprising edible hydrogenated oil and edible oily material blending therewith."

I also show you a certified copy of the Preliminary Statement of John J. Burchenal, dated February 15, 1913, filed in that
255 Interference, in which you state that the food product set forth in the Declaration of Interference "was made up in the latter part of May, 1908, and tested at Macon. Georgia." Was that material of which a sample was sent you by Mr. McCaw, the product to which you referred in that Preliminary Statement?

A. I presume it was.

Mr. May: I offer in evidence in behalf of the defendant the two certified copies shown the witness in connection with the preceding question, and ask that the same be respectively marked "Defendant's Exhibit Certified Copy Declaration Ellis vs. Boyce vs. Burchenal Interference," and "Defendant's Exhibit Certified Copy Burchenal Preliminary Statement," together with this date and the initials of the magistrate.

Q. 1029. Then at the time of swearing to that Preliminary Statement, you regarded the material which had been made by Mr. McCaw at Macon, Georgia, using the hydrogenated oil which was sent him in the early part of May, 1908, as an edible product of lard-like consistency, comprising edible hydrogenated oil and edible oily material blending therewith, did you?

A. I think so.

Q. 1030. Well, that is the fact, is it not?

A. The fact was that I thought so.

Q. 1031. Do you still think so?

A. I still think so.

Q. 1032. When Mr. Kayser produced from cotton-seed oil hydrogenated fats having a melting point of 55½ degrees Centigrade, 60.3 degrees Centigrade, 39.3 degress Centigrade, 55 degrees
256 Centigrade, 42 degrees Centigrade, and 43 degrees Centigrade, he produced hydrogenized materials of varying consistencies, did he not?

A. Apparently.

Q. 1033. There is not any doubt about it, is there?

A. There doesn't seem to be.

Q. 1034. And are fats having respective iodin values of 52.26, 7.14 and 11, of different consistencies?

A. I think so.

Q. 1035. You have not any doubt about it, have you?

A. No; I haven't any doubt about it.

Q. 1036. Was the first hydrogenized oil that Mr. Kayser produced at Ivorydale, when he first demonstrated his ability to produce a hydrogenized fat, an edible material?

A. I do not know.

Q. 1037. What was there about it which would render it inedible?

A. Well, the material might have been inedible, to start with.

Q. 1038. I call your attention to the note, "E-5," entitled "Fat Hardening Process, by Edwin C. Kayser," which was read into the record in answer to Q. 851, which apparently shows that the oil

which Mr. Kayser started with was "summer yellow cotton-seed oil." That note also shows that the melting-point of the fat, after three hours, was 55.50 degrees Centigrade; that the melting point of the fat after six and one-half hours was 60.3 degress Centigrade. Was either of those two products an edible product?

A. I don't know. There was no thought in the mind of the people working on that, to make an edible product; they were simply trying to make a hardened fat.

Q. 1039. Well, entirely aside from what they had in their minds, was that an edible fat?

A. I can't tell you.

Q. 1040. How did that fat differ from the fat which was sent to Mr. McCaw, in May, 1908?

257 A. I know from these reports, that the melting-point of the fat, in the first case, was, after three hours, at 55.50 degrees Centigrade, melting point; after six and one-half hours, at 60.3 degrees Centigrade melting-point; that the iodin value of the fat was 7.14 per cent. In the sample that is reported here as of May 7, sent to Mr. McCaw, of Macon, Georgia, I notice that the melting-point of that material was 59.8 degrees Centigrade, the titre of the fatty acid was 59.8 degrees Centigrade; the melting-point of the neutral fat was 59.8 degrees Centigrade, and the iodin value of the fatty acids was 11 per cent. I do not recall any other differences, and I don't remember whether there were any differences.

Q. 1041. The melting point of 60.3, in the first case, and of 59.8, in the second case, would not render one edible and the other inedible, would it?

A. Not necessarily. As a matter of fact, on these samples we could not—at that distance it is impossible to say whether that first sample might have been edible or inedible. Something might have happened; it might have been burned—anything might have happened to it. It might be edible or inedible.

Q. 1042. But you don't remember anything about it, one way or the other, do you?

A. I don't recall that sample.

Q. 1043. So that what you have said in the previous answer was entirely guesswork on your part, as to what might or might not have happened to that oil?

A. Merely a surmise. I don't understand what you mean by "My previous statement in regard to it?" What statement do you refer to?

Q. 1044. Why, you said it might have been burned, for example? I say, that is really a surmise, or a guess on your

258 part? You don't know whether that happened or not, do you?

A. No. We were simply trying to harden the material.

Q. 1045. Does a summer yellow cotton-seed oil contain a greater proportion of stearin, than winter cotton-seed oil?

A. I understand so.

Q. 1046. And is it for that reason that it is selected by compound manufacturers for making lard substitutes?

Question is objected to as incompetent, irrelevant and immaterial.

A. Summer yellow oil, prime summer yellow oil, prime summer yellow oil, bleachable, is selected by lard manufacturers because it is the easiest way to produce and the cheapest way to produce the character of oil they want. Winter oil would be an additional expense and there would be no object in it.

Q. 1047. In other words, if you started with the winter cotton oil, you would have to add a greater proportion of the stiffening agent to make the lard substitute?

A. I should think so; as well as the additional expense of making winter oil.

Q. 1048. Is a hardened product consisting of hydrogenized oil, having a melting point of 39.3, and an iodin value of 52.26, edible?

A. Read that question, please?

Q. 1049. I am going to change the question.

A. Yes?

Q. 1050. Does a hardened hydrogenized cotton-seed oil having a melting point of 39.3, and an iodin value of 52.26, have a large proportion of olein, a small proportion of linolin and only enough saturated fat to make it congeal at ordinary temperature?

259 Mr. Allen: The question is objected to as incompetent, irrelevant and immaterial and having only possible reference to the food product under Patent No. 1,035,351, not involved in litigation in this case.

A. It would certainly congeal at ordinary temperature.

Q. 1051. But does such a product have a large proportion of olein and a small proportion of linolin, with only enough stearin to make it congeal at ordinary temperature?

The question is objected to upon the same grounds as above noted.

A. I don't know that I can say, off-hand, what the proportions of olein and linolin are in the material you refer to. I don't think I know. I certainly do not recall.

Q. 1052. Did you know Mr. McCaw at the time that Mr. Procter first called upon him and showed him the piece of hydrogenized fat?

A. I had met Mr. McCaw a number of times.

Q. 1053. Did you know what was his reputation as a compound maker?

A. In a general way.

Q. 1054. He was considered as a man of high grade, as a high grade compound maker, and his goods had a good reputation on the market?

A. I thought so.

Q. 1055. And he was regarded as a skilful, expert man in his line of business?

A. I thought so.

Q. 1056. As far as you know, Mr. Procter thought so, too?

A. I rather think he did.

Q. 1057. And in sending this hardened cotton-seed oil to
260 Mr. McCaw in May, 1908, it was assumed that he would subject the compound to be made therefrom to the usual approved methods of treating materials in the manufacture of lard substitutes?

A. Yes.

Q. 1058. And he did so, so far as you know?

A. In a general way, I presume he did.

Q. 1059. At that time, so far as you know, "Flake White" was a high grade lard substitute?

A. That is my impression.

Q. 1060. Now, at the time you sent, or Mr. Procter or the Procter & Gamble Company sent that first batch of hardened cotton-seed oil to Mr. McCaw, had you made up your mind that that hydrogenized oil produced by Mr. Kayser, was an edible oil?

A. I had.

Q. 1061. How long before?

A. It is difficult to say. Some time before I had come to the conclusion myself that it was edible.

Q. 1062. Although you had not, in point of fact, used it for any cooking purposes?

A. No—nor have not yet.

Q. 1063. And had anyone in your behalf used it for cooking purposes prior to that time.

A. Not that I know of.

Q. 1064. So that you arrived at that conclusion by a process of cerebration?

A. Exactly.

At this point a recess was taken to half-past two o'clock in the afternoon of the same day, Friday, October 20, 1916, at which time the further taking of depositions proceeded as follows:

261 JOHN J. BURCHENAL resumed the stand and was further examined as follows:

By Mr. May:

Q. 1065. Mr. Burchenal, in the defendant's interrogatories filed in the court by the defendant in this case, there was this question: "22. State whether a food product simulating lard, and consisting of a mixture of an oil and of a hardening agent produced by hydrogenizing an oil or liquid fat, was manufactured or sold with the knowledge of the patentee, Burchenal, or with the knowledge of any of the officers of the plaintiff corporation, either at Cincinnati, Ohio, or Macon, Georgia, or elsewhere, within the United States, at any time prior to November 10, 1908, more than two years before the filing of the Burchenal application on November 10, 1910?"

Your answer to that interrogatory was as follows:

"22. Such a food product was made experimentally at Macon, Georgia, prior to November 10, 1908, but not elsewhere, to my knowledge. Do not know whether any of such product was sold prior to said date."

Now, was the food product to which you referred in your answer that same product that was made by Mr. McCaw at Macon, Georgia, in May, 1908, which product consisted of a mixture of a hardened cotton-seed oil and cotton-seed oil?

A. That was the food product referred to.

Q. 1066. Question 23 of those interrogatories reads as follows:

"State whether an edible hydrogenized fatty oil was manu-
262 factured, used or sold by the plaintiff corporation, or by its knowledge, or by the patentee, Burchenal, or with his knowledge, at any time prior to November 10, 1908, more than two years before the filing of the Burchenal application of the patent in suit on November 10, 1910?"

Your answer to that interrogatory reads as follows:

"23. The same answer as answer No. 22 above."

Was the food product to which you referred in your answer to that interrogatory No. 23, that same food product which Mr. McCaw made at Macon, Georgia, in May, 1908, and in which he used the hardened cotton-seed oil which had been sent to him by Procter & Gamble Company in the early part of May, 1908?

A. It is the same product.

Q. 1067. Now, you have said in your "Preliminary Statement," which is "Defendant's Exhibit Certified Copy Burchenal Preliminary Statement," that that product which was made at Macon, Georgia, by Mr. McCaw, was tested at Macon, Georgia. Who tested it?

A. I don't know.

Q. 1068. How did you know it was tested?

A. I understand that it was.

Q. 1069. When was it tested?

A. I presume at the time it was made.

Q. 1070. What tests were made with it?

A. I don't know.

Q. 1071. You certainly did not make any tests at Macon, Georgia?

A. No.

Q. 1072. When did you learn that this product was tested at Macon, Georgia?

A. I don't believe I can recall.

Q. 1073. Who told you that it was tested?

A. I don't believe I can recall that, either.

Q. 1074. You don't recall?

A. But I presume, Mr. McCaw.

263 Q. 1075. Why was it that you said that that product was made up in the latter part of May, 1908?

A. Well, that was my recollection at the time, that that was when it occurred. That was my understanding of it.

Q. 1076. Now, Mr. Burchenal, when, after May, 1908, did you first produce a satisfactory commercial food product, consisting only of cotton-seed oil and hardened cotton-seed oil?

A. I don't recall when we first made a satisfactory food product of only cotton-seed oil and hardened cotton-seed oil.

Q. 1077. Well, have you no recollection at all about the matter? Cannot you say approximately when it was?

A. No, I cannot.

Q. 1078. Was it as early as in May, during the year 1910?

A. I would not be sure about it. I would not be sure as to the date when that material was produced only of cotton-seed oil and hardened cotton-seed oil, though I believe some material was made in 1909—though I am not sure about it.

Q. 1079. Who would know about that? Who would be sure about it?

A. Well, I think Mr. McCaw would be more likely to know than anyone else.

Q. 1080. Mr. Burchenal, if an edible fatty product of substantially lard-like consistency were made up of a mixture of hardened cotton-seed oil, of approximately an iodin value of eight or nine, and cotton-seed oil, and the mixture contained approximately ten per cent. of the hardened cotton-seed oil and ninety per cent. of the cotton-seed oil, would the final product be a white, or yellowish, semi-solid, having an iodin value of about ninety-five, a melting-point of about forty-two degrees Centigrade and a titre of about thirty-six, Centigrade?

264 A. I think it would, substantially. I don't know about that melting-point of forty-two. I think it would have an iodin value of about ninety-five and a titre of about thirty-six.

Q. 1081. Is the iodin value of a product one of its physical constants?

A. I don't know.

Q. 1082. Between the time that Kayser produced his first product by hydrogenization at the plant of Procter & Gamble Company, and the time when the hardened cotton-seed oil was sent to Mr. McCaw, in May, 1908, had you substantially determined that that hardened oil was an edible product?

A. I cannot say that we had substantially determined that; but I was satisfied in my own mind that it was.

Q. 1083. How did it happen that that sample which Mr. McCaw sent to Procter & Gamble Company from Macon, Georgia, after he had made that first mixture, was kept so long before you saw it? You will remember that you said it kept perhaps a couple of months before you saw it; that it was stringy and streaky and sticky. Now I am inquiring the reason why, or how it happened that that product was kept so long before you saw it?

A. I don't think that I said it was kept so long. I am not sure about that. It may have been long, or it may not have been. I don't remember.

Q. 1084. Had it been kept in a cool room?

A. I don't know.

Q. 1085. If that material had been kept in a fairly warm place, where it was subjected to variations in temperature, that would have injured the physical appearance of it, would it not?

A. If it had gotten very warm—but I don't think that was likely, though. The sample was sent up to us for inspection, and I supposed it was to represent the lot.

Q. 1086. Now, when the commercial plant for hydrogen-
265 izing oil was started in operation in February, 1909, was the hydrogenized oil produced at that plant substantially like the hydrogenized oil that you had sent down to Mr. McCaw's in May, 1908?

A. Substantially.

Q. 1087. And nothing more was done to make that oil edible, any more than had been done before, when it was made by Mr. Kayser?

A. I am not certain about that; but I don't think there was any material difference. The plant was a complete plant, and of course we could handle large quantities there in a somewhat different way from what we could in a small, experimental plant which was hydrogenizing about twelve, fifteen or eighteen pounds to a batch.

Q. 1088. But the processes of producing those oils were substantially the same?

A. Yes.

Q. 1089. The oil was heated to approximately 155 degrees centigrade, and the nickel chemically deposited on kieselguhr was kept in agitation in the oil?

A. Yes.

Q. 1090. And the mixtures of oil and kieselguhr were brought into the presence of hydrogen?

A. That was substantially it. I don't remember the temperature at which it was handled; it may have been higher or lower; I believe it was higher.

Q. 1091. Prior to the issue of the patent in the present suit, No. 1,135,935, had the Proctor & Gamble Company produced a lardlike composition comprising edible hydrogenized fatty oils, in which no added ingredients were employed?

Above question is objected to as indefinite and misleading.

A. Such as oleo stearin?

266 Q. 1092. Such as oleo stearin, or such as cotton-seed oil?

A. Yes.

Q. 1093. And when was this material first produced?

A. I think some time about the middle of 1910.

Q. 1094. And what was the name that was subsequently given to that material?

A. We have given the name to it of "Hydro-Stearalin," but it is being sold under our brand of "Crisco" and "Selex."

Q. 1095. When this "Crisco" was first commercially produced, was it made of partially hydrogenized cotton seed oil?

A. It was.

Q. 1096. Was anything else added to it?

A. Nothing.

Q. 1097. And since that time, nothing else has been added to "Crisco" in its manufacture? So that it has been only hydrogenized cotton seed oil?

Above question is objected to as misleading.

A. I am under the impression that it has been made from other materials.

Q. 1098. Was this "Crisco" made at any time of oils other than cotton seed oil?

A. I am under the impression that some small lots were made of other materials; but I am not certain of that—whether it was ever made commercially, or not.

Q. 1099. Was this partially hydrogenized product subjected to the same after treatments as "Flake White," for example, after you had begun the addition of hardened cotton seed oil thereto, either at Macon, or at Ivorydale?

A. I don't understand the question?

Q. 1100. My question was, Was the after treatment for
267 "Crisco," the same as the after treatment for "Flake White?"

A. Substantially so.

Q. 1101. No material difference between the two after treatments?

A. You mean, after the mixture of the hard and soft material for making "Flake White"?

Q. 1102. Yes.

A. No material difference.

Q. 1103. How did this "Crisco" differ from that hydrogenized material which was produced by Mr. Kayser, and which had a melting-point of 39.3, and an iodin value of 52.26?

A. I don't ever recall seeing any such sample as that from Crossfield's.

Q. 1104. You saw the samples Mr. Kayser brought over with him, did you not, from Crossfield's?

A. Yes; but nothing like this, as I recall.

Q. 1105. I am going to refer once more to that sample of material that Mr. McCaw sent from Macon, Georgia, after he had made a product employing the hydrogenized oil, and will ask you whether or not the sample that you saw was rancid?

A. I don't recall that it was.

At this point an adjournment was taken to the following morning, Saturday, October 21, 1916, at half-past nine o'clock, at which time the further taking of the depositions proceeded as follows:

Morning Session.

Saturday, October 21, 1916.

The taking of depositions was resumed pursuant to adjournment; counsel present as heretofore noted.

268 By consent the deposition of Mr. John J. Burchenal is suspended and thereupon

ALBERT EDWARD ANDERSON, a witness produced in behalf of the defendant, having been duly sworn, deposes and says as follows in answer to interrogatories:

By Mr. May:

Q. 378. You are the same Mr. Albert Edward Anderson who previously gave a deposition in the case of Procter & Gamble Company vs. The Berlin Mills Company, and you were subpœnæd to testify in this case, also?

A. Yes.

Q. 379. When the lard substitutes were first made at Ivorydale, which consisted, as I understand it, of oleo stearin, cotton-seed oil and Kayser's hydrogenized cotton-seed oil, in what proportions were the three ingredients mixed?

A. I don't know exactly; but about one per cent. of oleo, fourteen or fifteen of stearin made from cotton-seed oil, and the balance cotton-seed oil.

Q. 380. What do you mean by "Stearin made from cotton-seed oil"?

A. The hydrogenized cotton-seed oil.

Q. 381. I understand from Mr. McCaw that at Macon, in manufacturing the lard substitute employing these three ingredients, the ingredients were at first compounded in substantially the proportions of nine per cent, oleo stearin, three per cent, hydrogenated oil and the balance cotton-seed oil. Do you know how long the compound was thus made, with the three ingredients in the proportions given?

A. I do not.

Q. 382. And you do not know whether those ingredients
269 were compounded in those proportions until the oleo stearin was finally left out altogether? I am referring, of course, to the compound made at Macon, Georgia?

A. I do not.

Q. 383. But these substitutes that were made at Macon, Georgia, and at Ivorydale, were both sold under the same trade-name of "Flake White," or "Invincible," as the case might be?

A. Yes.

Q. 384. And they were sold bearing the same labels, and so far as you know, were used for substantially the same purpose, without anyone knowing the difference?

A. Yes.

Q. 385. As to the lard substitutes that were made at Ivorydale with these three ingredients, did you thereafter reduce the proportions of oleo stearin, before you left it out altogether?

A. I think we did.

Q. 386. In arriving at the proportions of these ingredients, was that done by first determining the titre thereof, and then combining the ingredients so as to give the product the desired titre?

A. Yes; substantially so.

Q. 387. That is the usual method of combining oils and a stiffening material in making a lard substitute?

A. Yes.

Q. 388. In your previous testimony, you said that the first lard substitute produced at Ivorydale, suitable for edible purposes, was in April, 1910. Up to that time had all of the hydrogenized oil been sent from Ivorydale to Macon, to be compounded into lard substitute?

A. All that we did not use in the soap factory.

Q. 389. Was there any difference in the titre of the hydrogenated material that was used for soap purposes, and the hydrogenated material that was sent to Macon, Georgia, for lard substitute purposes?

270 A. We paid no attention to the titre of what was used in the soap factory, because we used in the soap factory only the rejected material.

Q. 390. For what reason would you reject materials?

A. Oh, we would accumulate barrels of samples; perhaps taking a sample of a pint, taking a few drops out, and throw the rest into the barrel. That was all used in the soap factory. Besides that, any material that leaked on the floor, that became dirty or unfit for use in any way, was put in the soap factory.

Q. 391. So that the titre of the hydrogenated oil which was sent to the soap factory was substantially the same as the titre of that which was sent to Macon, Georgia, for use in the lard substitute?

A. Most likely it was—most of it was.

Q. 392. In your previous deposition, I understood you to say that you installed a deodorizer at Ivorydale, within a year from February, 1909. After that deodorizer was installed, was the hydrogenated product which was sent to Macon to be used in the manufacture of a lard substitute, deodorized before it was sent?

A. Yes.

Q. 393. But previous to that time, it was not deodorized before it was sent to Macon?

A. No; but it was deodorized after it got to Macon.

Q. 394. And before it was compounded?

A. Yes.

Q. 395. Prior to February, 1910, had the hardened cotton-seed oil which had been sent to Macon, Georgia, been subjected to Fuller's Earth treatment, after being hydrogenated?

A. At Macon. Not at Ivorydale.

Q. 396. At Macon, Georgia, was the hydrogenated product subjected to both deodorization and the Fuller's Earth treatment before it was mixed with the cotton-seed oil and the oleo, or was it subjected to these treatments after it had been mixed?

A. After the mixture.

271 Q. 397. So that before the mixture of the hydrogenated product with the other ingredients in the manufacture of a lard substitute at Macon, the hardened cotton-seed oil was not preliminarily deodorized, or treated with Fuller's Earth?

A. No.

Q. 398. In answer to questions 338 and 339, of your previous deposition, you said that in hydrogenizing cotton-seed oil for soap

stock, you have to use a higher percentage of catalyst, and higher temperatures. Why is this?

A. Because for soap purposes we used inferior oils, which required higher percentages and sometimes a higher temperature to bring about a quick reaction. We could do the work with the same percentages, under the same conditions, perhaps, if we wanted to take our time to it.

Q. 399. In other words, in that case, in order to secure a more speedy reaction, you used a higher percentage of catalyst and a higher temperature?

A. Yes.

Q. 400. To what titre did you hydrogenate the cotton-seed oil for soap stock?

A. Our standard is, and has been all along, about fifty-eight titre.

Q. 401. And for mixture with cotton-seed oil in the manufacture of lard substitute, what has been the standard titre of the hydrogenized oil?

A. Fifty-eight to sixty.

Q. 402. So that the titre of the material used for the soap stock, and the titre of the material used for the manufacture of a lard substitute are substantially the same?

A. Yes.

Q. 403. Have you ever ascertained any differences in the speed of reaction of linolin to olein and of olein to stearin?

A. I have never done any work along that line. I am not enough of a chemist to know much about that.

272 Q. 404. Is it your opinion that the greater the proportion of the catalyst to the oil, under any given temperature and degree of agitation of the oil and catalyst, while the oil is undergoing hydrogenation, the greater will be the proportion of the olein to the saturated fats, in a partly hydrogenized oil?

A. I don't know.

Q. 405. Is it your opinion that with a given degree of agitation of the catalyst and the oil, and a given percentage of catalyst to oil, that a variation in the temperature at which the reaction is crrried, would cause any variation in the proportion of olein to stearin, or olein to linolin, in a partially hydrogenized product?

The above question is objected to as incompetent, irrelevant and immaterial.

A. I have given practically no thought or attention to the proportions of linolin or olein, and I am not qualified to pass even an opinion upon that. I have already expressed an opinion in my previous testimony, but I have not given very much time to the consideration of these matters, and perhaps am not qualified to speak upon them.

Q. 406. You recall, Mr. Anderson, that in connection with Mr. Burchenal's deposition there were certain notes copied into the record, in answers to Questions 849 and 851 propounded to Mr. Burchenal. Were these notes prepared by you from data given by Mr. Kayser?

A. Yes, prepared under my direction.

Q. 407. Were you present when Mr. Kayser produced the product referred to in the note marked "E-5," entitled "Fat Hardening Process, by E. C. Kayser," as of the date of January 17, 1908?

273 A. I think I was. That was the first one. I am quite sure that was there when the first one was made.

Q. 408. The note entitled. "Demonstration by E. C. Kayser of Process for Hardening Fats, January, 1908. Treatment of Fats," copied into the record in Mr. Burchenal's answer to Question 849, was prepared by you after you saw the demonstration which produced the product, set forth in note "E-5," as of the date of January 17, 1908, was it not?

A. Yes.

Q. 409. Previous to your seeing Mr. Kayser produce his product on January 17, 1908, had you known just how the process of hydrogenization was carried out?

A. Only from what he had told me.

Q. 410. He had told you, in a general way, before that time, substantially what the process was?

A. He had given me the information from which I ordered the apparatus.

Q. 411. I take it you did not attempt to dictate to Mr. Kayser how he should carry out his process in any way?

A. Absolutely not. I attempted to provide him every facility.

Q. 412. And left it to him to practice his process and produce the product himself?

A. We followed his suggestions in every particular.

Q. 413. That was true of these products that are referred to in the reports of Mr. Kayser which have been produced?

A. I don't think Mr. Kayser had anything to do with "E-49." He had no apparatus for testing the titre, and these numbers look like my numbers under which they would be sent to the laboratory for testing. No. 116 means 1/16; No. 18 means 1/8. Kayser had no apparatus in his laboratory for testing the titre at that time.

274 Mr. Allen: Allow me to suggest a question: It is not whether Kayser did it, but whether he did all these things of his own motion.

A. Well, I said I thought Kayser had nothing to do with "E-9."

Q. 414. And except that, these other products were produced by Mr. Kayser of his own initiative?

A. Yes.

Q. 415. This note, "E-9" do you know for what purpose the tallow and the cotton seed oil were mixed?

A. I do not. I don't recall.

Q. 416. Then that mixture of hardened cotton seed oil and prime tallow was sent to the laboratory for the purpose of determining the titre?

A. Yes.

Q. 417. That is to say, you wanted to see what the titre would be if you mixed the hardened cotton seed oil with tallow in different proportions?

A. Yes. We were accustomed to send these samples, as all others were sent, to the laboratory, with only an indicating number, without any other designation as to what they were.

Q. 418. I suppose Mr. Kayser felt very well pleased at the successful result of his demonstration?

A. Yes; he was very well pleased.

Q. 419. Quite elated?

A. Well, I suppose you could call it elation. He was very well satisfied. He was always very well satisfied with the co-operation he received from me.

Q. 420. I have not any doubt of that, Mr. Anderson—because the co-operation that he received was unquestionably very intelligent co-operation. And you were doing the best you could to furnish him every facility that he needed for carrying on his work and producing his product?

275 A. Yes; I think I can say that we set aside other important work to promote this, to give him the right of way.

Q. 421. How did you make the mixture of tallow and hardened cotton seed oil, of which the titre was determined in the note marked "E-9"? Did you first melt the hardened cotton seed oil and the tallow and blend them together?

A. We always mixed those mixtures in the liquid or melted state. Most likely the proportions were determined by measuring them in graduated flasks.

Q. 422. Then how did you mix them?

A. Stirred them together with a rod or spoon.

Q. 423. Very much as you stir up sugar in coffee, I suppose, with a teaspoon?

A. Yes.

Q. 424. So as to get a thorough and intimate mixture?

A. Yes.

Q. 426. So far as you know, is hydrogenized oleic acid suitable for use as a food product?

Question objected to as irrelevant, incompetent and immaterial.

A. Yes—You said hydrogenized oleic acid?

Q. 427. Yes?

A. Oh, no; I would not consider oleic acid in any form—You mean olein, do you not?

Q. 428. No.

A. Not oleic acid; I do not think that is considered an edible product, whether it is hardened or whether it is not hardened.

Q. 429. Do you know whether or not any of those products that Mr. Kayser produced as the result of hyrdogenization in 1908, contained any nickel soaps?

A. I do not.

Q. 430. Who would know about that?

A. No one but Mr. Kayser.

Q. 431. How about the product he produced in 1909 by
276 hydrogenization. Did that contain any nickel soaps?

A. I don't know.

Q. 432. So far as you know, it did not?

A. No—they did not.

Q. 433. You did not have supervision, did you, Mr. Anderson, of the compound plant at Ivorydale? Or is that under the direct supervision of Mr. McCaw?

A. Oh, I have that. Mr. McCaw has nothing to do with that. Mr. McCaw has charge of the Sales Department and Flake White, but he does not superintend or oversee the manufacture of the compound. I have that in my charge.

Q. 434. In the manufacture of Flake White, for example, or other similar lard substitute in which hydrogenized cotton-seed oil is mixed with cotton-seed oil, has it been customary to vary the proportion of the ingredients according to the locality to which the product was to be sent, whether North or South?

A. Not at Ivorydale—at Macon we did make it harder for the extreme Southern points.

Q. 435. And in making a harder substitute, you necessarily used a larger proportion of the hydrogenized oil?

A. Of the harder fat, yes.

Q. 436. And did you likewise vary the proportions, according to whether the material was to be sold in the winter or in the summer?

A. Yes.

Q. 437. What is regarded as a desirable titre for a lard substitute which is to be sold and used in the winter time?

A. Speaking in a general way, approximately thirty-three to thirty-four.

Q. 438. And what is the desirable titre for a product to be sold in the summer time in the South?

A. Approximately thirty-four to thirty-five.

Q. 439. And knowing the titre of the hydrogenated fat, and the titre of the oil with which you are to use it, it is easy to com-
277 pound these ingredients in proportions to get the desired titre of the product?

A. Not as easy as would appear. We make a theoretical mixture and test a sample of that mixture; if it is not correct, we add more of one or the other to bring it to the desired point; but all of this mixing is done in scale tanks, so that we can do it quite accurately.

Q. 440. That is the usual method of compounding oils and stiffening agent in the manufacture of a lard substitute?

A. Yes, I think so.

Q. 441. Do you know what is the diameter of the chilling rolls at Macon, Georgia, which were used in the production of Flake White, for example?

A. I think they are about four feet in diameter.

Q. 442. What is the speed of rotation of those rolls?

A. The speed can be varied from one revolution, to, perhaps, twenty, by a variable speed counter-shaft.

Q. 443. What is the standard speed of rotation of those rolls for making Flake White?

A. There is no standard. The speed must be varied as the temperature of the brine varies.

Q. 444. What variation do you get in the temperature of the brine?

A. Oh, I don't know; but it would be readily possible to have a variation of twenty degrees.

Q. 445. From what temperature to what temperature?

A. From zero to twenty degrees above, or from ten degrees below zero to thirty above Fahrenheit. That is all governed by the operation of the refrigeration machine.

Q. 446. So that if the temperature of the brine rises, you slow down the speed of the rolls, and vice versa?

A. Yes. If we could maintain the brine at an approximately fixed temperature, it would not be necessary to vary the speed
278 of the roll; but to maintain an absolutely fixed temperature is impossible. It varies during the day.

Q. 447. What would you regard as the optimum temperature of the roll, or the optimum speed?—You understand what I mean by "Optimum," do you?

A. Yes.

Q. 448. That is to say the best, the most desirable?

A. In my opinion the optimum temperature for such a material as Flake White would be about ten degrees above zero, and I think at this temperature the speed of the rolls should be about eight.

Q. 449. Eight R. P. M.?

A. Yes; eight R. P. M. I have not done any work on the lard rolls for some time, and the speed I have stated would not be exactly right, perhaps,—may not be exactly right; but I know that I like ten degrees above, for temperature—and I think I am about right on the speed.

Q. 450. When you have your rolls at approximately the temperature and the speed given by you, within the ranges given by you, is the liquid compound first preliminarily cooled by a cooling roll?

A. No.

Q. 451. At approximately what temperature is the liquid compound delivered to the chilling rolls?

A. At about one hundred and ten to one hundred and twenty-five or one hundred and thirty degrees.

Q. 452. Fahrenheit?

A. Yes.

Mr. Barrows: That is practically standard practice?

A. I think it is.

Q. 453. And so far as the temperature and speed of the chilling rolls are concerned, you follow substantially the same procedure in manufacturing "Crisco?"

279 Question objected to as incompetent, irrelevant and immaterial.

A. Yes.

Q. 454. Except for the fact that "Crisco," if I understand it, is a partially hydrogenized cotton seed oil, or a cotton seed oil in which

the hydrogenation reaction is stopped short of actual complete hydrogenization, and that in a lard substitute such as Flake-White the material consists of a compound of the hydrogenized cotton seed oil and cotton seed oil, is there any difference in the after-treatments of these two materials, so far as purification, clarification, deodorization, chilling and beating are concerned?

Question objected to as incompetent, irrelevant and immaterial.

A. There is substantially no difference. They are both treated according to methods which are pretty well known, pretty generally known, for the treatment of such edible fats.

Q. 455. Do you utilize a different temperature for "Crisco," than for Flake White, so far as the chilling roll is concerned?

Objected to as incompetent, irrelevant and immaterial.

A. We find that as a rule, slightly higher temperatures are necessary for "Crisco."

Q. 456. What would you say as to the speed of rotation of the beaters for these two products? Are those speeds different?

Objected to as incompetent, irrelevant and immaterial.

280 A. There may be a slight difference; I don't know about the exact speeds; most likely the "Crisco" beater operates at slower speed than the "Flake White" beater.

Q. 457. Is it not a fact that the consistency and the appearance of a lard compound, of a lard substitute or prepared shortening, depend very materially upon the extent to which it is beaten, and the degree of seration of the material in this process of manufacture?

A. The specific gravity of the fat is, of course, influenced by the speed of the picker-shaft; the faster the pick shaft revolves, the more beaten up is the resultant material and the more aerated. Of course, a more aerated product looks different from a product which is less aerated.

Q. 458. It is whiter, for example, is it not?

A. Most likely it would be whiter.

Q. 459. Referring to the hardened cotton seed oil which was sent Mr. McCaw by the Procter & Gamble Company in the early part of May, 1908; That hardened cottonseed oil consisted of the accumulation of a number of batches which had been hydrogenized by Mr. Kayser on the small machine, did it not?

A. Yes. We tried to get a thousand pounds, but it took so long we got tired waiting.

Q. 460. Were these various batches all melted and mixed together before the material was sent?

A. I think not.

Q. 461. Then how did you arrive at the titre of that batch of hydrogenized oil which was sent to Mr. McCaw, which appears in the note, "E-12," at page 138?

A. Most likely we took a piece out of each container and mixed them together and this is the average.

Q. 462. And that is the titre of the composite material?
A. Yes.
Q. 463. In producing a lard substitute in which Winter
281 White oil is combined with hydrogenated fats, is it necessary to use a greater proportion of the hydrogenized material?

Above question is objected to as irrelevant, incompetent and immaterial.

A. I presume it would be, although I don't know anything about it, as we have never done it. It would be rather a foolish thing to do.
Q. 464. Because, in that case, you would have to put back some of the stiffening material which you had taken out of the cotton seed oil in treating it, so as to make it Winter White oil?
A. Exactly.
Q. 465. Summer Yellow cotton seed oil is a refined cotton seed oil, is it not?
A. Yes.
Q. 466. And as such, it is an edible oil?
A. Some Summer Yellow oil is edible; some is, I think, over the line.
Q. 467. Some might have too much free fatty acid in it?
A. Well, the percentage of free fatty acid should not vary greatly; but the percentage of other ingredients might; the percentage of hydrocarbon, for instance—take some imported oils, such as Egyptian, Indian, Chinese oils, which may be graded as Summer Yellow oil; but some of them are shipped in tin cans that have had kerosene in them—but as Summer Yellow, it answers that specification.
Q. 468. The Summer Yellow oil that Mr. Kayser used in making his product, however, was oil that you had refined here?
A. Yes.
Q. 469. And which was edible?
A. Yes; that was edible.
Q. 470. The question arose yesterday with Mr. Burchenal as to whether or not in the manufacture of "Crisco,' any oil had
282 been used except cotton seed oil. Will you state whether or not any oils other than cotton seed oils have been used in the manufacture of "Crisco"?

Question objected to as incompetent, irrelevant and immaterial.

A. It is my recollection that we have used some small quantities of peanut oil.
Q. 471. How about olive oil?
A. And some olive oil, but in a very limited way.
Q. 472. Has any cocoanut oil been added to the cotton seed oil?
A. Not to my knowledge or recollection.
Q. 473. And in the manufacture of "Crisco" nothing has been added to the original hydrogenized oil?
A. Nothing.

Cross examination.

By Mr. Allen:

X. Q. 474. In manufacturing "Flake White" at Macon, Georgia, after March, 1909, you spoke of deodorizing the material at Macon. What was the process of deodorization used?

A. Why, it was the ordinary deodorization process, which consists in putting the oil to be deodorized into a closed vessel, agitating it with steam, dried and superheated, and maintaining it under vacuum during treatment.

X Q. 475. Is that a well known process, used prior to 1909?

A. I think that is a process that has been used—a process that has been well known for many years, and most likely prior to 1909.

X Q. 476. That is the process of deodorization used at Ivorydale?

A. Practically the same. It differs from what was done
283 at Macon in 1909, only in a very few details.

X Q. 477. What is this process of treatment with Fuller's Earth? Is that a well known process?

A. The treatment of oil with Fuller's Earth has been well known for many years.

X Q. 478. Prior to 1909?

A. Oh, yes.

By Mr. May:

R. D. Q. 479. The method of deodorization is one of the secrets that you said had been jealously guarded in connection with the manufacture of these products?

A. The details of our present method are secret.

R. D. Q. 480. How long have you had your present method?

A. We have been developing it for six or eight years.

R. D. Q. 481. And had reached a practically successful development in the early part of 1910?

A. No.

R. D. Q. 482. When was it completely developed?

A. Well, I don't know that we have it completely developed now. We are triyng to improve the results all the time.

R. D. Q. 483. Have you materially changed the process of deodorization since the early part of 1910?

A. Not materially.

(Signed) A. E. ANDERSON.

Attest:

FRANKLIN LEACH.

At this point an adjournment was taken to Monday morning at ten o'clock, October 23, 1916, at which time the further taking of these depositions proceeded as follows:

284 Morning Session.

Monday, October 23rd, 1916.

The taking of depositions was resumed pursuant to adjournment; all counsel present as heretofore noted.

Thereupon, WALLACE EUGENE MCCAW, called as a witness in behalf of defendant, having been first duly sworn, deposes and says as follows in answer to interrogatories:

By Mr. May:

Q. 196. You are the same Mr. Wallace Eugene McCaw who previously gave a deposition in the case of Procter and Gamble Company vs. Berlin Mills Company, and you have also been subpœnaed to testify in this case?

A. Yes.

Q. 197. Prior to the incidents about which I inquired in the Berlin Mills Company case, that is to say, prior to your meeting Mr. Procter and being shown a sample of hydrogenated cotton seed oil, how long had you been in the business of manufacturing a lard substitute, approximately?

A. Twelve or fourteen years.

Q. 198. And being as you graphically described, chief cook and bottle washer for your company, you were familiar with all of the details of the manufacture of these lard substitutes?

A. I was.

Q. 199. Had your product a fairly wide sale?

A. Yes, east of the Mississippi River.

Q. 200. And I take it your product enjoyed a well deserved reputation?

A. Yes.

Q. 201. And it was your constant endeavor that your goods should be of high grade and deserve the above reputation?

A. It was.

285 Q. 202. So far as any comparison of your lard substitutes, Flake White, Invincible and the like, with other lard substitutes on the market, they were as good as any?

Mr. Allen: You are meaning then or now?

Q. 203. Then they were as good as any?

A. In our opinion they were.

Q. 204. That was all prior to 1908, the period you are talking of?

A. Yes.

Q. 205. And I suppose that you would not have cared at any time to put out as Flake White, a lard substitute which was not as good, or as high grade, as the Flake White that you were then making?

A. Certainly not, as a matter of choice.

Q. 206. That was the reason that you first got Colonel Proctor's visé on the product which you made in the first part of 1909, in which you used a hardened cotton seed oil, before you actually put that Flake White on the market?

A. Do you mean after the plant was bought?

Q. 207. Yes; my question relates to the time when they sent you a carload lot from Procter and Gamble Company and you made up the first lot of Flake White, using in its composition a hardened cotton seed oil?

A. I did not consider the quality of the lard substitute that contained the hydrogenized fat at that time equal to the quality upon which the Flake White and Invincible brands had been established, and as I preferred for the Procter and Gamble Company to take a part of the responsibility of the shipment of these, I made a trip to Cincinnati and talked it over.

Q. 208. And Colonel Procter told you to go ahead with the sale of that Flake White, even though it was not, in your opinion, equal to the quality of the Flake White that you previously made?

286 A. Either he or Mr. Burchenal; I do not recall; but the Procter and Gamble Company assumed the responsibility of the shipments being made.

Q. 209. Did you have any trouble from customers with that Flake White that you made first using the hardened cotton seed oil and the oleostearine, together with the cotton seed oil?

A. I do not recall any—except very few indeed.

Q. 210. What was their objection to it?

A. They gave no reason, except they said they did not think it was as good as we previously had shipped.

Q. 211. Now, when you first——

A. I would like to add to that, that they did state that the goods did not look like the other; that was their principal complaint, that it didn't look like the other.

Q. 212. That is, that it was a little yellower?

A. The appearance was not right, the texture—no, the color was all right I think by that time.

Q. 213. What was the texture of the first batch of Flake White in which you used the hydrogenated oil, the oleo stearin and the cottonseed oil in 1909?

A. Of the first batch?

Q. 214. Yes?

A. The texture was quite normal so to speak, very much like the ordinary Flake White which, however, was due to the fact that not a very material percentage of the hydrogenized fat was used.

Q. 215. In the first batch, if I remember what you said correctly, you employed three per cent. of hydrogenized oil, nine per cent. of oleo stearin, and eighty-eight per cent. of Summer White Cotton Seed oil; how long did you continue to use those proportions in the manufacture of the lard substitute at Macon?

A. I should say for from March, 1909, to December, 1909, or January, 1910, at which time the quality of the hydrogenated

287 fat, and also the lard substitute, began to show improvement sufficient for us to reduce the amount of oleo stearin.

Q. 216. And you did reduce the amount of oleo stearin then?

A. Yes.

Q. 217. How much of the oleo stearin did you then thereafter use, until you left it out altogether?

A. As well as I can recall, we reduced it down to one per cent. of oleo stearin in it.

Q. 218. Why did you use any oleo stearin at all?

A. First, to retain the service of the Government Inspector; second, at the time under consideration, both distributors and consumers of lard substitutes were quite favorably affected by the fact that the lard substitutes that they bought or used, were Government inspected.

Q. 219. Now, in the manufacture of your Flake White prior to January and February, 1908, did you use the best grade of beef stearin and the best grade of cotton-seed oil?

A. Yes.

Q. 220. Obtainable?

A. Yes.

Q. 221. Mr. McCaw, where are the records of the McCaw Manufacturing Company, prior to January, 1909? Are they still at Macon?

A. Prior to 1909?

Q. 222. Yes?

A. I really do not know.

Q. 223. They have not been brought to Ivorydale, so far as you know, have they?

A. No.

Q. 224. Or to Cincinnati?

A. I think they have been destroyed, but I don't know.

Q. 225. You have not seen them for many years?

A. No; I have not seen them, not since I left there in 1909.

Q. 226. In the manufacture of Flake White and your like products, prior to, we will say, January, 1908, what was your
288 custom respecting the products to be sent to different parts of the country, or to be sold at different seasons of the year? Did you vary the amount of stearin according to the season, or the climate of the locality in which the products were to be used?

A. Yes.

Q. 227. That is, for a cold climate you would use less of the stiffening material than for a warm climate?

A. Yes.

Q. 228. And for winter time you would also use a greater proportion of the stiffening material than you would use for the summer time?

A. No; a smaller proportion.

Q. 229. I should have said a smaller proportion?

A. Yes.

Q. 230. Were these proportions figured out more or less empirically, or were there accurate formulæ, according to the titres of the ingredients?

A. Well, our oleo stearin that we bought ran quite regularly in titre; that was one of the strict conditions we had when buying it; so

the percentage used was also to suit conditions, there being no regular time of year, for example, of making the change. If we had an early fall, the change was ordered made sooner than if we had a late fall.

Q. 231. And if you mixed your ingredients together according to their titre, but found that the mixture was a little softer or harder than you wished, then you added more stearin, or more oil, as occasion demanded?

A. Yes.

Q. 232. So as to get approximately the same consistency?

A. Yes.

Q. 233. At all seasons of the year?

A. Yes.

Q. 234. And even if you ran your mixture over the roll and found that the compound was not just as you wanted it, the operator in charge would run the compound back into the mixing tank
289 for the addition of oil, or oleo stearin, as might be demanded?

A. Yes.

Q. 235. We have spoken more or less of different oils and in order to get it clear on the record, I will ask you this question: Summer Yellow oil was a refined cotton-seed oil which was not bleached; Summer White oil was substantially the same oil, except that it had been bleached fairly white. Winter White oil, however, was a cotton-seed oil from which the stearin had been removed and which was also bleached. Is that fair?

A. Yes—a portion of the stearin.

Q. 236. Then Winter Yellow oil would be cotton-seed oil which had been refined and from which a portion of the stearin had been removed, but which had been bleached?

A. Yes. If I may suggest, each time there you have spoken of Summer Yellow oil. Do you wish to say Summer Yellow cotton-seed oil?

Q. 237. Yes?

A. Because there are a great many other oils known as Summer and Winter Yellow oils.

Q. 238. Yes; I wish to confine my questions to cotton-seed oil?

A. Yes; cotton-seed oil.

Q. 239. What was the function of the oleo stearin in the compound? Was it that of stiffening or hardening the cotton-seed oil so that the mixture would be semi-solid at ordinary temperatures?

A. Our object in using oleo stearin in the manufacture of a lard substitute was to give the oil the consistency approximating the consistency of hog lard.

Q. 240. And inasmuch as cotton-seed oil, per se, at ordinary temperature was a liquid, you added the oleo stearin to harden it sufficiently so that at ordinary temperatures it would have approximately the consistency of lard.

A. Yes.

290 Q. 241. Do you recall what was the diameter of the chilling rolls that you used in the manufacture of Flake White, prior to February, 1908?

A. Four and a half feet, I think.

Q. 242. Approximately to what temperature were these rolls chilled?

A. About five to six degrees above zero, Fahrenheit at that time.

Q. 243. When the rolls were chilled to that temperature, at approximately what R. P. M. were they rotated?

A. I do not recall—that is eight or nine years ago.

Q. 244. If you had a variation in the temperature of your chilling rolls, it was common practice to correspondingly change the speed of the rolls to compensate for this temperature variation?

A. That was only possible in very little variations.

Q. 245. It was quite important to the appearance of the lard substitute to have the rolls chilled to the proper temperature and properly speeded, was it not?

A. Yes; but more important for its texture.

Q. 246. And it was important to have the beaters rotated at fairly accurate speed, in order to secure the desired texture?

A. There was a proper speed for the beaters—picker shaft, I would rather say.

Q. 247. Referring now to those first three batches of compound which you made up, using the hardened cotton-seed oil which was sent to you about the early part of May, 1908, can you recall definitely the proportions of the hardened cotton-seed oil that were used in those three batches?

A. To the best of my recollection we tried ten, twelve and fourteen per cent.

Q. 248. In those three batches that you made up, you did not use any oleo stearin, did you?

A. No.

Q. 249. In to what were these batches pumped from the lard rolls?

A. Into small containers, the largest one was a sixty pound tub.

291 Q. 250. You pumped then into the regular containers that you used for Flake White?

A. Yes, except that we did not use any tierces, that is.

Q. 251. And the packages of course were unlabeled, I suppose?

A. No; the packages were labeled Flake White and lithographed. We used just such packages as we had around the factory and they were all labeled either Flake White or Invincible.

Q. 252. How long did it take the compound to set in those packages, if you know?

A. Not over four or five hours, I should say. The samples were run in the afternoon about five o'clock; I left there about six o'clock and did not see them again until the next afternoon, at which time of course the setting was completed.

Q. 253. Well, would you say that at six o'clock, you could tip the package sidewise without it flowing out?

A. I do not remember absolutely that; but my experience would show that you can tip it without its flowing, because the first part of the setting was quite rapid.

Q. 254. Where were those containers placed then?

A. In a locked room.

Q. 255. Was the locked room cooled?

A. No.

Q. 256. The locked room was at ordinary interior temperature at that time?

A. Yes; which was quite warm.

Q. 257. So that you made no effort to keep those packages containing the compound in a cool place?

A. No; not at that time.

Q. 258. And finally after a couple of months, if I understood you correctly, the compound was dumped out of those containers or receptacles, into larger barrels or tierces, prior to its being sold?

A. Yes.

292 Q. 259. Since having your attention called to the matter, have you been able to recollect to whom those barrels or tierces of the compound were sold?

A. No; I do not; I don't know positively; but I think to Birmingham, because we made sales at that time of rancid fat to a buyer in Birmingham—sales of that grade of material; but that is all recollection, supplied principally by my brother James N. McCaw.

Q. 260. How long would it have taken your ordinary Flake White to turn rancid, if you kept it under similar conditions as you kept this compound?

A. At that season of the year, in May, and in tins, about sixty to ninety days.

Q. 261. Did the compound made up in those three batches turn rancid?

A. They had a very peculiar odor, one that I never detected before, but it was very objectionable and would be passed by laymen as being due to rancidity.

Q. 262. You did not test those batches of compound for rancidity, did you?

A. Any more than to taste them and smell them, not by cooking with any of the samples.

Q. 263. When you did your first cooking with the samples you took home? Those samples were not rancid then, were they?

A. Not in my opinion. They had a peculiar odor, however.

Mr. Barrows: Was that the same odor you noticed later?

A. No.

Q. 264. Do you remember who the buyer was at Birmingham who purchased those?

A. I do not.

Q. 265. Do you know for what concern he was buying?

A. I do not.

293 Q. 266. In the manufacture of those batches, did you pass them through the then standard process of filtration with Fuller's Earth, deodorization, chilling and beating?

A. The batches of compound?

Q. 267. That first lard compound, just as you had been accustomed to treat your Flake White in the course of its manufacture?

A. One of the batches was run, was prepared and run, exactly as

our Flake White. The other two batches were changed at first only in regard to brine temperature, speed of rolls and picker shaft speed. I do not recall any further variations from the regular method in making Flake White.

Q. 268. And in making Flake White, it was your standard practice at that time to filter the mixture with Fuller's Earth and then to deodorize it, before passing it to the chilling rolls?

A. No; we treated our oils with Fuller's Earth before it was mixed with the oleo stearin; after the mixture, we deodorized the oleo stearin and the oil together.

Q. 269. In the manufacture of one of those batches which you made up of hardened cottonseed oil and cottonseed oil, in May, 1908, you did not subject the mixture after being mixed, to filtration with the Fuller's Earth, did you?

A. Not that I recall at all.

Q. 270. Because that was not your regular procedure in making Flake White?

A. It was not. I can tell shortly just what we did do?

Q. 271. I would be very glad if you would, Mr. McCaw? Tell just what you did do?

A. The oleo stearin and the cottonseed oil which had been previously bleached to the standard grade of white cottonseed oil, were mixed; the white oil also having been previously deodorized by the usual method; the mixture of oleo stearin and oil was deodor-
294 ized together, again, the method used being that which was common at that time. The mixture was then allowed to chill at about 160 degrees Fahrenheit, at which temperature it went into the first roll, being chilled on the first roll down to about 105 or 110 degrees Fahrenheit, at which temperature it went onto the second roll. With these three experimental batches, we did not watch the odor of our mixture as much as I did the texture and looks of the goods. What was uppermost in my mind at the time was to produce goods that would at least appear of the standard and quality of Flake White, as I had hopes of selling the goods produced under the Flake White brand. The samples were small comparatively and we of course had to act very quickly; so my first effort was based on changing that part of the manufacture, namely, the chilling rolls, picker-shaft, speed of both rolls and picker-shaft, and brine temperature that would produce goods of the proper texture and appearance.

Q. 272. Now, when you received that second shipment of the hardened oil in the year 1908, which shipment as I understand you, was about one thousand pounds——

A. As well as I recall.

Q. 273. Did you mix the hardened cotton-seed oil with the cotton-seed oil in approximately the same proportions that you had previously mixed the batch in May, 1908?

A. We made some variations, in our effort to improve on the consistency of the goods we were endeavoring to produce. I do not recollect just what that variation was; my recollection is that it was not a very broad variation.

Q. 274. Now, when you mixed up that first batch in May, 1908, how did you arrive at the proportions of the ingredients?

A. Why, I took the titer of the hydrogenated fat, and
295 you might say guessed at it—well, not exactly guessed, either, because my experience would show me, from the number of years I have been in this business, that the fat at a certain titer would take a certain amount of cotton-seed oil to produce the consistency that we wished to obtain in the lard substitute.

Q. 275. So that you figured the proportions approximately by having before you the titer of the hydrogenated oil, and the titer of the cotton-seed oil, and made your mixture accordingly?

A. Yes.

Q. 276. Did you make your own titer test of that hydrogenated material, or was that supplied to you?

A. If I recollect, we made it, and then got it afterward.

Q. 277. You were left to your own resources in making up the mixture?

A. Oh, absolutely, at that time.

Q. 278. When, in March, 1909, you made the first batch of Flake-White, of cotton-seed oil oleo stearin and hydrogenated cotton-seed oil, did you follow the same course of procedure that you had previously followed in making Flake-White?

A. No.

Q. 279. What change did you make in the procedure?

A. Well, we changed the deodorization in so far that we increased the temperature of the deodorizer quite perceptibly, feeling that we might get rid of the very objectionable odor.

Q. 280. But you followed the usual procedure of first deodorizing the cotton-seed oil and bleaching it, then mixing it with a stiffening agent?

A. Yes, we bleached the cotton-seed oil first; then deodorized it after it was bleached; then we mixed the three ingredients, the oleo stearin, the cotton seed oil, and the hydrogenized cotton seed oil and then deodorized the mixture.

296 Q. 281. But you did not treat the mixture with Fuller's Earth?

A. Not that I recollect.

Q. 282. So that, except for the temperature of deodorization, you followed substantially the same procedure that you had previously followed in making up the batch in 1908?

A. Followed substantially the same procedure; we also, however, extended the time of application of the live steam in the deodorizer, for the same reason that we increased this temperature.—This refers to batches now?

Q. 283. Yes. After you started producing Flake-White with the three ingredients, in March of 1909, did you thereafter continue, in all of the Flake-White that you made, to use hydrogenized cotton-seed oil?

A. To the best of my recollection we used it in all of the Flake-White.

Q. 284. In the manufacture of the Flake-White beginning in

March of 1909, did you use a different temperature for the chilling-rolls, a different speed of the chilling rolls, and a different speed of the picker-shaft from those which you had employed in making up the batches of compound using the hydrogenated oil in 1908?

A. Yes.

Q. 285. How did the general appearance of the 1909 product compare with the batch of product in 1908?

A. Well, the 1909 products were very much better than the first experimental lots, both in texture and appearance.

Q. 286. They were not quite so yellow and quite so grainy as the batches that you produced in 1908, is that so?

A. Well, I think the principal reason that they were better, was the fact that the 1909 batches contained comparatively a small portion of hydrogenated fat, we still being uneasy about the
297 quality of the lard substitute manufactured of the hydrogenized fat; so we used a very small portion of the fat.

Q. 287. There was not anything unwholesome about any of this material, that is, the material you made in March of 1909, or made in batches in 1908, was there?

A. Well, the 1908 batch I should say was quite unwholesome. We certainly would not have eaten it.

Q. 288. Well, it would not have poisoned you, would it?

A. It would have made me sick at the stomach.

Q. 289. But you were not sick at the stomach, were you?

A. Because I didn't eat it.

Q. 290. Now, Mr. McCaw, what became of those batches of biscuits that you made up in 1908?

A. I answered before that I supposed that the negro servants around the house may have taken them away; I don't know; but I ordered them thrown away.

Q. 291. I suppose if they took them away for their families, they probably ate them?

A. Possibly so; but I certainly had too much respect for them to ask them to eat them.

Q. 292. I understood you to say that you came to Procter & Gamble Company in Cincinnati about 1910?

A. The first of May, 1910.

Q. 293. And prior to that time you had remained at Macon in charge of the plant there?

A. Yes.

Q. 294. Now, at the time when you came to Cincinnati to Procter & Gamble Company, had the latter worked out a successful method of removing the objectionable flavor and odor due to hydrogenation of cotton-seed oil, from the hydrogenized product?

A. Let me see—May, 1910, that was—to the best of my recollection the hydrogenized fat had been improved in quality
298 decidedly, and this, connected with, you might say, the ordinary changes that we had made in deodorization and using the rolls—and by "ordinary" I mean that any man in the business would naturally feel his way and work to the proper speeds and temperatures, and so forth—in short, by using ordinary intelligence as the result of our experience, we, or I will say I, I began for the

first time to have quite confidence—quite good deal of confidence in an hydrogenized lard substitute being equal to the old oleo stearin and cottonseed mixture, both as to flavor, keeping qualities, and cooking.

Q. 295. So that, I take it, by May, 1910——

A. To the best of my recollection, along about that time we began to feel pretty sure of ourselves, that we had something.

Q. 296. And by that time the processes of deodorization, and so forth, had been worked out, so that there was no longer any objection to the hydrogenized material, because of its flavor or odor?

A. Well, I don't know now about the actual manufacture of the hydrogenized fat to go into the details.

Q. 297. But you were not having any trouble?

A. Not having any trouble at that time with the goods that we were shipping out, and I know that so far as I was concerned, I had begun to feel quite confidant.

Q. 298. And by that time the proportion of oleo stearin had been reduced to practically nil, had it not?

A. I am very poor on dates as far as that, Mr. May, but I should think it was about that time, or possibly a little later. First, we labeled this stuff for some months, a year or so, it seems to me, cottonseed oil, cottonseed oil stearin and oleo stearin; then we got
299 finally a ruling from the government, which was late in 1910, I think, as to how it should be labeled; those instructions were to label it cottonseed oil, stearin made from cottonseed oil, and oleo stearin.

Q. 299. Mr. McCaw, you have just made a statement off the record in explanation of this matter, and I have not the slightest objection to your placing on the record just what you have said, and as I understand you, it was substantially as follows: That when you first made the mixture of the three ingredients, you had to call this third hydrogenated oil by some name in order to properly label your packages; so you called it "cottonseed stearin," and after you had taken this matter up with the government one of the officials of the Bureau of Animal Industry claimed that it was not straight cottonseed stearin, and wanted you to put on the label that it was stearin made from cottonseed oil. That is substantially your statement?

Mr. Allen: And also that he knew at the time?

A. Yes.

Q. 300. And that the government knew at the time?

A. That we know.

Q. 301. That you know that that was the fact?

A. Yes; I know it was not cottonseed stearin, of course.

Q. 302. But at that time, in the summer of 1910, you had reached the point where the proportions of oleo stearin in the mixture were practically nil?

A. To the best of my recollection, it was about that time, and it was for that reason that some definite ruling by the government had to be obtained; because the facts of the case were that we were
300 not using oleo stearin in appreciable quantities, enough for us to have an inspector there, without the government's consent and without the government knowing exactly what we were doing.

Q. 303. Then it was after that time that you decided to leave out the oleo stearin altogether and get rid of the inspector and merely use the two ingredients, to wit: cottonseed oil and the hydrogenized cottonseed oil ?

A. To the best of my recollection—as to the exact date, it was after that time.

Q. 304. And during all of this period, from the time when you first began to use the hydrogenized cottonseed oil at all, until some time after you had completely eliminated the oleo stearin from the lard substitute, the consumers did not know any difference, so far as the use of the compound or substitute was concerned?

A. I can't give you the date exactly, but it was late in 1909 that we tried a number of shipments, probably our total manufacture for two or three weeks, that contained almost all hydrogenized fat, with about one per cent. only of the oleo stearin. We had trouble with those goods; we took quite a little of them back. I remember distinctly saying, "I told you so, that we are going too fast with the quantity of hydrogenated fat; we are going to ruin our brand." After that we made a second effort of using practically all; I grew nervous over that. Then we gradually got the thing where we could use only one per cent.

Q. 305. So that, so far as the general public and consumers were concerned, the only comments or objections that you received were due to the presence of the hydrogenated fat in the compound?

A. Well, that is the way we felt about it. I mean, we did
301 not know anything else that we had done unusual—I mean different, except to use this; but what I mean to bring out is, we made several batches of this thing reduced to one per cent. before we were on safe ground, in my opinion.

Q. 306. Now, you have said that after you had made this first batch in 1908 of the compound, you sent a request for another shipment of hydrogenized oil. Did you make that request in writing, Mr. McCaw, or was it an oral request, do you remember?

A. No, I do not remember; in fact, I am sure that this was really—I was in this position—that I did not do anything by correspondence, really, for this reason, that I made a date to meet Mr. Procter, probably, but that would be in the old files, any such correspondence—but the Procter & Gamble Company knew nothing about the manufacture of lard substitute, and it was a thing that I certainly thought important enough—it was to me and my company—to talk the thing out; and I either met them in New York—and by "they" I mean either Mr. Procter or Mr. Burchenal—or in Cincinnati at times. I could easily go to New York via Cincinnati. I had a branch office in New York and had to go there frequently, and the thing was threshed out in that way.

Q. 307. So that there are not any written records?

A. Not so far as I know.

Q. 308. No written records retained?

A. Not retained at all.

Q. 309. In regard to the batches, or the manufacture?

A. Absolutely—nothing about those batches at all, so far as I know, that was retained.

Q. 310. And you did not send them in writing any comments upon the materials that you had received for hydrogenating the oils?

A. Oh, I may have written, or wired, that I had run the
302 experiment. I wired that night that I had run the experiment and would send samples to what was called "Watch Hill"—I think it was Mr. Procter's summer home—at least it used to be; that was the first time I had ever heard of Watch Hill.

Q. 311. So you sent the samples immediately?

A. My recollection is that he was to be in New York in a few days—in fact, I am sure about this; I sent the samples by express, I think, to the Manhattan Hotel, and went to New York, and we examined it; I showed him its defects and faults, and his only comment was, "Well, I still believe that it is possible to make an edible product out of this thing," and that is about all he said. He is a man of few words, any way.

Q. 312. Mr. Anderson testified that when they began making Flake White at Ivorydale, ap-roximately in April, 1910, they used only one per cent. of oleo stearin in the mixture. I suppose that at that time, at Macon, Georgia, you had reduced the proportion of the oleo stearin to about that same one per cent., had you not?

A. To the best of my knowledge I think we had.

Q. 313. When you first met Mr. Procter in New York, at your New York office, at the time when he showed you that sample of hardened cottonseed oil, were you then acquainted with Mr. Burchenal?

A. To the best of my recollection I had never met Mr. Burchenal up to that time, though I knew of him.

Q. 314. Take in the early part of 1908, were there then on the market lard substitutes or shortenings which were yellow or of a yellowish appearance?

A. I think there were several.

Q. 315. Were they any more yellow than the batches you made
up in May, 1908, from the hydrogenated cotton-seed oil sent
303 you by the Procter & Gamble Company?

A. Yes, they were made from yellow cottonseed oil; whereas the 1908 batches were made from white cottonseed oil.

Q. 316. So that they were white in appearance?

A. They were more yellowish than the batches were.

Q. 317. Your brother, Mr. James N. McCaw, is now located at Macon?

A. Yes.

Q. 318. The McCaw Manufacturing Company do not make soap, do they—or did they in those early days prior to 1908?

A. Yes.

Q. 319. When you made up the Flake White, in March, 1909, from the first carload shipment of hydrogenized cottonseed oil sent you by Procter & Gamble Company, how did you arrive at the titre of the three ingredients used therein?

A. My recollection is that I gave instructions to go very slowly on using in very large proportions the hydrogenated fat; as I was

still, in my own mind, doubtful as to its adaptability for an edible product, and I did not use—I do not think over—certainly not exceeding five per cent., and I don't think over two per cent., at first, did I allow to be used. As to the percentage of oleo stearin to go with this, it was a matter of titre, figuring how much oleo that required.

Q. 320. So that, having in mind that you did not use over two per cent. of hydrogenized cottonseed oil, you were able, knowing the titre of that hydrogenated oil and the titre of the oleo stearin, and the titre of the cottonseed oil, to arrive at approximately the proportion of oleo stearin that would give you a product that would have the desirable consistency?

A. Yes—the titres you speak of, plus about sixteen years' experience.

304 Cross-examination.

By Mr. Allen:

X Q. 321. Under the old practice, prior to 1908, in the manufacture of lard compound with oleo stearin, did you have to change from time to time the temperature of the brine, or the R. P. M. speed of the lard-rolls, to conform to the titre of the oleo stearin or the proportion of the cottonseed oil?

A. Oh, no.

X Q. 322. You did not?

A. We fixed those things in order to produce a uniform standard of goods.

X Q. 323. Variations in the titre of the oleo stearin, or the condition of the cottonseed oil, did not require any change in the speed of the rolls?

A. Well, if we did not—we could do either; we chose to fix the titre of our batches. I have no doubt that other manufacturers—in fact, I have been in factories where they just mixed their oil and oleo stearin without any regard whatever to titre; and then they attempt to bring the uniformity of their goods to the proper point by varying the speed of the rolls.

X Q. 324. And the temperature of the brine?

A. And the temperature of the brine; but usually the rolls; I don't know—I wouldn't say the temperature of the brine—only the rolls, as far as my information goes, as to what they did.

X Q. 325. Was it customary, in deodorization, prior to 1908, to vary the temperature to conform to the conditions of the material under treatment?

A. Why, I don't think so. The deodorizing process at that time was in common practice among those engaged in handling fats, and it was pretty generally known, I think. A certain number of hours' live steam of a certain temperature, deodorizing the cottonseed oil and the oleo stearin—I think that was done day in and day
305 out; I don't think the average manufacturer did any more than, I will say, repeat each day his process. I don't suppose

that any two people, in a way, ran the deodorizer just the same—as any two cooks would not cook fried chicken just the same way; all would be fried, but some would be very much better chicken than the other.

X Q. 326. So far as you know, then, there is a variation in the temperature of deodorization the same as there is in methods of cooking fried chicken?

A. Yes. I don't think any two people would run the deodorization the same. The general principle is all I mean—just like frying chicken; the chicken, the stove and the heat may all be the same; but two cooks will have very different ways of doing it, and produce very different results.

X Q. 327. Did your process of deodorization that you were using prior to 1908, differ from the ordinary process of deodorization?

A. Why, I don't think so at all. In taking people through our factory, I mean customers, we tried to throw a little uncertainty around it by saying, "You must not go in there," but anybody in business—I think we all had the same process, in the case of heating and steaming.

X Q. 328. Was the process of deodorization used on these batches in which the hardened stock was used, in 1908, and different from the other?

A. Well, as I stated, at first, for the first batch, we used deodorization—we deodorized the batch just as we would the eleo stearin and cotton-seed oil; but we found, as I have previously stated, that the results were not satisfactory; and on subsequent batches we
306 simply did what anybody else, in a way, would have done, with experience in that line. We tried different temperatures, different live steam—used our experience—that was all, to land at what was the best for the product, and we finally landed with something that we considered was adaptable for that kind of a product.

By Mr. May:

R. D. Q. 329. And after you found what was best in the way of deodorization temperature, etc., you kept that secret, I suppose?

A. Well, only secret in this way: I mean that other people have taken this stuff—I have several friends who are just as good in it as we are—they have taken it and found out just what we found out; in fact, there is nothing to find out there, that an experienced person would not just follow out; as with the fried chicken, if the chicken is not cooked done enough for what you want, your experience, if you are an experienced chicken cooker, would tell you what to do. I would not call it a secret in that sense of the word at all, no; it is quite open to anyone who has had any experience in deodorization.

R. D. Q. 330. That is to say, the general practice of deodorization with live steam, was known as such, but each of the manufacturers kept to himself the temperature and the particular details of it?

A. Years ago, long before that, they did; but by this time it was general. I don't know the smallest concern in the cotton oil business

that was not deodorizing their stuff. Twenty-five years ago we used to whisper around and go around quietly.

R. D. Q. 331. But you have never told anybody, however, your precise method of deodorizing these hydrogenated products?

307 A. Oh, I don't know that I, personally, have ever told them the exact temperatures; but in talking, in comparing notes about general business, I am quite sure that I have said that we found a longer deodorization was better, or something of that kind. I know I haven't given the exact thermometer at which we did it; but among people in this business, I mean, I certainly would not call it any secret, because anybody who has had the slightest knowledge of that kind can go and do just what we did, so far as that is concerned.

R. D. Q. 332. That is, any man could start in and experiment and arrive at satisfactory conclusions?

A. And could do it very, very quickly, provided he had had any former experience in that line—very quickly. It is like this: After you have done a thing for somebody else, it is very easy after that, comparatively, to come along—at least it is much easier, when you tackle a process that you know has been solved, than one where you enter upon it with grave doubts.

(Signed) W. E. McCAW.

Attest:

——— ———.

At this point a recess was taken to 1:30 o'clock in the afternoon of the same day, Monday, October 23, 1916, at which time the taking of depositions continued as follows:

308 Monday Afternoon Session.

October 23, 1916.

The taking of depositions was resumed pursuant to recess; counsel present as heretofore noted.

Thereupon JOHN J. BURCHENAL, being recalled by the defendant, testified further as follows:

Examined by Mr. May:

Q. 1106. In questions 1023 and 1024, I asked you to produce certain correspondence between Proctor & Gamble Company and Mr. McCaw. Are you now able to produce all of the correspondence which you found, which occurred during the year 1908, touching the matters referred to in questions on page 286?

A. I have here all the correspondence I have been able to find between the McCaw Manufacturing Company, Mr. McCaw and Proctor & Gamble Company, and Mr. Proctor or myself, during the period mentioned, relating to the subject referred to.

Q. 1107. Will you be so good as to read into the record these letters which you have produced?

A. I will do so as follows:

Said letters by true and compared copies are hereinafter set forth as follows:

"May 6, 1908.

Wallace Eugene McCaw, Macon, Georgia.

DEAR MR. BURCHENAL:

I have just wired you per attached confirmation, as I think
309 it best to have this experimental lot shipped to my home instead of care of the Company, as I wish to handle this matter so that the Government Inspector here will not have an opportunity of being too inquisitive.

Yours very sincerely,
(Signed) W. E. McCAW.

Mr. J. J. Burchenal, Cincinnati, Ohio."

(Enclosed Confirmation.)

"McCaw Manufacturing Company, Macon, Ga.

The following message sent you to-day is hereby confirmed:

May 6, 1908.

J. J. Burchenal, Care Procter & Gamble Co., Cincinnati, O.

If experimental lot not shipped, please direct to 563 College Street instead care McCaw Company.
12k" W. E. McCAW.

310 "MACON, GA., June 27th, '08.

DEAR MR. BURCHENAL:

I am of course interested in making a thorough trial of the one thousand pound lot referred to several weeks ago. Do you know how soon you will be able to forward same?

Hoping that you will have an enjoyable and successful trip, I am
Yours sincerely,
(Signed) W. E. McCAW.

Mr. J. J. Burchenal, Cincinnati."

"August 17, 1908.

Wallace Eugene McCaw, Macon, Georgia.

DEAR MR. BURCHENAL:

I would like to have a short talk with you and Mr. Proctor on his return to Cincinnati at some time convenient to both of you.

With kindest regards, I am

Yours very truly,

(Signed) W. E. McCAW.

Mr. Jno. J. Burchenal, Cincinnati, Ohio.

311 (Carbon Copy.)

"The Procter & Gamble Co.

Form 83.

CINCINNATI, August 28, 1908

Mr. W. E. McCaw, Macon, Ga.

MY DEAR MR. McCAW:

Mr. Procter has returned to-day and I now learn that he will be here next week. I have been unable to give you this information earlier. We will be glad to see you at your convenience.

With best regards I remain

Your- very truly,

(Unsigned).

"Wallace Eugene McCaw, Macon, Georgia.

August 28, 1908.

DEAR MR. BURCHENAL:

The four boxes arrived today and I expect to use them next Tuesday or Wednesday. Will report as soon thereafter as possible.

Yours very truly,

(Signed) W. E. McCAW.

Mr. J. J. Burchenal, Cincinnati, Ohio."

312 September 3, 1908.

"Wallace Eugene McCaw, Macon, Georgia.

DEAR MR. BURCHENAL:

Please accept thanks for your favor of the 28th ultimo. I regret very much that it was impossible for me to get to Cincinnati this week; and as Mr. Procter advises me he will be absent next week, I hope to arrange to come through Cincinnati on the 14th instant on my way home from New York.

With best regards, I am,

Yours sincerely,

(Signed) W. E. McCAW.

Mr. Jno. J. Burchenal, Cincinnati, Ohio."

Q. 1108. Refreshing your recollection from reading these letters, Mr. Burchenal, are you now able to state that a second shipment of hardened cotton-seed oil was sent to the McCaw Manufacturing Company, or to Mr. McCaw, in the summer of 1908?

A. Referring to Mr. McCaw's letter of August 28, 1908, I notice his reference to four boxes of material which he states arrived on that date. This apparently refers to another shipment of hardened material, which I think must have been the second shipment.

(Signed) JOHN J. BURCHENAL.

Attest:

———

313 Also, HARLEY J. MORRISON, a witness produced in behalf of the defendant, having been first duly sworn, deposes and says as follows, in answer to interrogatories:

By Mr. May:

Q. 1. Will you state your name, age, residence and occupation?

A. Harley J. Morrison; age, fifty; residence, Clifton, Cincinnati, Ohio. My occupation now is Chemical Superintendent of Procter & Gamble Company.

Q. 2. And you were subpœnaed to testify in this case, Mr. Morrison?

A. I was.

Q. 3. As Chemical Superintendent, what comes under your jurisdiction?

A. I have charge of the chemical laboratories and the technical work of Procter & Gamble Company.

Q. 4. That is, you have charge of both the analytical and the research laboratories?

A. Yes.

Q. 5. How long have you been in charge of the laboratories?

A. Since the first of December, 1910.

Q. 6. And prior to that time——

A. Prior to that time, I was engaged in various pursuits for Procter & Gamble Company.

Q. 7. Prior to 1910, did you not supervise the chemical and research work of Procter & Gamble Company?

A. Not for eight or ten years. I came with the Procter & Gamble Company in 1887. At intervals, up to probably eight or ten years after that, I had more or less charge of the chemical laboratories. After that I had superintendence of various departments, but never of the chemical department until I was made Chemical Superintendent the first of December, 1910.

Q. 8. For two or three years prior to December 1910, just
314 what were your duties for Procter & Gamble Company, and where were you? I wish you would start your answer with say, 1907?

A. In 1907, I was superintendent of our factory—Procter & Gamble Company factory—at Kansas City. In about March, 1908,

I was recalled to Ivorydale. I did some chemical research of a technical character, on the making of a formula, or getting up a formula for a certain soap we are now manufacturing; and it was about June or July of that year that our superintendent at Port Ivory on Staten Island was taken ill and asked for a vacation. I went down there to relieve him, and after his return, I took my vacation. Upon my return to that plant, I found him still ill, and asked for instructions. They told me to stay there, and Mr. Skillman, the superintendent, was sent on a prolonged vacation. I stayed there until the following spring. Upon my return I was not connected directly with the chemical laboratory, but I did research work of various kinds,—I would not say I had charge of it, because I did not have charge of certain portions of the work; but I did research work; I consulted with Mr. Burchenal and Mr. Anderson, practically every morning, on various subjects throughout the factory.

Q. 9. And your beginning of that research work was in the spring of what year?

A. Upon my return from Kansas City, in 1908.

Q. 10. So that you kept up your research work after that from the spring of 1908 until when?

A. Right until I took charge of the chemical laboratory, and was made Chemical Superintendent on the first of December, 1910.

Q. 11. So that from the spring of 1908, until you actually took charge as Chemical Superintendent, you were doing research
315 work in the laboratories and were in constant touch and communication with Mr. Burchenal and Mr. Anderson?

A. No, I wish to change your question—not with the laboratories more than the samples and such that I would send up there; I did not see him do the work, or superintend the work. I did these experiments myself and would send up any samples that I wanted up to the laboratory; but I was in touch with Mr. Burchenal and Mr. Anderson on the results of my work.

Q. 12. With what was this work principally concerned?

A. It was quite varied.

Q. 13. Did it have to do in any way with hydrogenating oils?

A. Not with the hydrogenation of the oil, but with the oils after they were hydrogenated.

Q. 14. When did you first begin to do any work on the oils or fats which had been hydrogenated?

A. Some time in 1909; I would not be able to place it exactly.

Q. 15. What was the character of that work?

A. That was of a very general character, as to the characteristics and other various points about the oils, but not the actual hydrogenation of it.

Q. 16. That is to say, you personally did not have anything to do with producing this hydrogenated oil or fat?

A. No, sir.

Q. 17. But you were analyzing them for the purpose of ascertaining their physical and chemical characteristics?

A. I did not have anything to do—any questions that came up, I would probably get samples and make certain physical tests. I did not make any of the chemical tests, or supervise them.

316 Q. 18. What were the physical tests that were made on these?

A. It was to see the point at which they would congeal; to see if we could not get a smooth article out of them smoother than we had been able to get.

Q. 19. Of what did these substances consist? Would they consist solely of hydrogenated oil, or would they consist of cottonseed oil which had been hydrogenated, and other ingredients?

A. In the case of the compounds, which were of course mixtures of very hard stock, of both cottonseed oil, cocoanut oil and a number of oils we tried in experimental ways—and the other—it probably was straight hydrogenated oil.

Q. 20. Was that cottonseed oil which was straight hydrogenated oil, of a semi-solid consistency, or was it of a hard consistency?

A. Semi-solid.

Q. 21. When did you first have the semi-solid hydrogenated cottonseed oils sent to you for examination as to their physical characteristics?

A. Some time in 1909 was when I first came in contact with it.

Q. 22. Did you make any examination of these materials to ascertain their iodine value?

A. I had it done.

Q. 23. Do you know the procedure of ascertaining the iodin value?

A. I do. I did not do it myself, but I know that they did it, though.

Q. 24. What was the purpose of ascertaining the iodin value? To ascertain the degree to which the oil was saturated with hydrogen?

A. You mean on these partially hydrogenated oils?

Q. 25. Yes.

A. At the time I came in, was taken into this thing and asked my opinion, though I had been in consultation on the thing—Mr. Burchenal spoke to me about this oil—that here was a partially hydrogenated oil, which had a low iodin number, but a remarkably

317 low congealing point; he was under the opinion that the only way that could be gotten, was, that the linolic acid had been saturated first. If the olein had saturated first, we would have had a harder material at that point at which the iodin indicated the saturation. We set about to see if that was not so. We had a number of tests made which indicated that that was the fact. We did not have a great many tests made, as I remember, because the laboratory process was rather laborious and not very certain; that is, it had to be done two or three times before we were quite certain of those results.

Q. 26. What did you find out as to the matter of the conversion of linolic glyceride to a higher glyceride?

Counsel for Procter & Gamble Company wishes to enter an objection in this inquiry to all questions relating to the matters and things set forth in Letters Patent No. 1,135,351, which is not in suit in this case; and to any matters in connection with the determination of the various component parts of the product, which are not referred to in the patent in suit, No. 1,135,935, and it is understood

that this objection may be entered to all questions along this line, without specially making objection each time, on the ground that such inquiry is irrelevant, incompetent and immaterial.

Counsel for the defendant has no objection to the objection being made by counsel for the plaintiff in this way, in so far as the objection may be applicable to the questions and answers; but during the further examination the relation of these matters to the patent in suit will be fully brought out.

318 A. The tests we made by determining the iodin value on the fatty acids, then on the liquid fat acids, showed us that our theory, or idea, about the saturation was correct—that the linolic, to a large extent, saturated first.

Q. 28. That is to say, it was your observation that the linolin was first changed to, say, olein, without a corresponding change of olein to stearin?

A. That is correct, sir.

Q. 29. So that in the final product you would have a fairly large proportion of olein, and a small proportion of linolein?

A. That is correct, sir.

Q. 30. In other words, you determined that there is a certain selective action that takes place during the hydrogenation?

A. Yes.

Q. 31. And the speed of re-action of linolein to olein was very much greater than that of olein to stearin, under the particular conditions of hydrogenation that were then practiced?

A. Well, we tried quite a number of conditions and found that to be the same, in each case.

Q. 32. Now in order to arrive at these results it was necessary to determine the iodin value of the respective hydrogenation fats, and then determine the iodin value of the liquid fatty acids, I take it?

A. It was.

Q. 33. Had you at that time ascertained the iodin value of cottonseed oil, say, Summer Yellow cottonseed oil and Summer White cottonseed oil?

A. We had.

Q. 34. What did you find the iodin value of these oils approximately to be?

A. Well, of an oil that is not contaminated with anything else, the iodin value of a Summer cotton oil is about 110, that is the glycerides, but the fatty acids, are about 114, I think it is. In these determinations we have got the fatty acids—but the cottonseed

319 oil is about 110, and with all the liquid fat acids it will run as high as 147, I find.

Q. 35. Having found that the liquid fatty acids were approximately 147, and knowing the iodin number of the oleic acid, and the iodin number of the linolic acid, you could easily ascertain that linolic acid was found in those liquid fats in greater proportion than oleic acid, could you not?

A. Yes.

Q. 36. So that in this original cotton oil, the linolic acid would

be in excess of the oleic acid, and correspondingly linolein would be in excess of olein?

A. If they exist in that way.

Q. 37. What glycerides did you find in cottonseed oil?

A. Well, I never made an exhaustive test; I always considered the glycerides were palmitic, oleic and linolic.

Q. 38. You found in the cottonseed oil also, as one of the saturated fats, stearic, as well as palmitic?

A. In the saturated, you are speaking of?

Q. 39. In the cottonseed oil?

A. Raw cottonseed oil?

Q. 40 Yes.

A. Raw cottonseed oil, I think there is very little, if any, stearic acid present.

Q. 41. But the unsaturated glycerides are oleic and linolic?

A. According to our test.

Q. 42. And the linolic was in excess of the oleic?

A. Yes.

Q. 43. Now, if you had before you the iodine value of the cottonseed oil, and the iodine value of the liquid fatty acids, could you not easily calculate the proportion of the linolin, the olein and saturated fats in cottonseed oil?

A. If there were just those three unknown quantities, yes.

Q. 44. Well, assuming, if you please, that the cottonseed oil that you used had an iodine value of 110, and that the iodine
320 value of the liquid fatty acid was 147, what would be the percentages contained in the cotton seed oil of linolin, olein and saturated glycerides?

A. Without making very careful calculations, but speaking within a per cent. or two of error, there would be in the cotton oil approximately 21.2 per cent. saturated fats; 34 per cent. olein and 44.8 per cent. linolin.

Q. 45. Now, in producing this hydrogenated fat, in which you say there seemed to have been a selective action by which the olein was increased, without affecting the same increase in the stearin, do you know what temperature was used in the hydrogenization, and what proportion of catalyst to oil was used during the process of hydrogenization, in order to secure that result?

A. We used ordinarily, approximately one temperature; but in our experiments we found that we could use from quite a low temperature up to a fairly high temperature. We could use a small percentage of catalyst, or a large percentage of catalyst, without affecting that characteristic, the selective characteristic. The only thing we found was the slower or faster saturation.

Q. 46. In other words, so far as your observation went, the only change that resulted in partly hydrogenized oil, due to variation in temperature and variation in the proportion of catalyst, was the time it took to hydrogenize the oil?

A. So far as we have been able to see, we get sometimes different results, in which we had hopes of finding an optimum temperature,

and an optimum amount of bleach, but have never been able to put our finger upon it.

Mr. Allen: By "bleach" you mean catalyst, do you?

A. Yes. It does bleach, you know, too.

321 Q. 47. Now, in the operation of hydrogenization, what did you find to be the optimum temperature prior to November 10, 1910?

A. I had not found any optimum temperature.

Q. 48. What was the standard temperature that was used?

A. In the laboratory tests, 170 degrees Centigrade was the temperature then, as it is now.

Q. 49. And how about the practical machines? At what temperature were they run?

A. In practice the machines will—the hydrogenization will begin somewhere between 150 to 160 degrees Centigrade, and the heat of reaction will carry that up somewhere over 200 degrees Centigrade.

Q. 50. Did you find it desirable in any way to regulate the temperature to compensate for the exothermic reaction?

A. Yes, after it gets beyond, I think our point is 240 in commercial fats—that is to prevent decomposition, that is the only purpose of it.

Q. 51. So that care must be taken to prevent the heat of the reaction carrying the fat undergoing hydrogenization up beyond the temperature of 240 degrees Centigrade?

A. As in most chemical operations, that is a fact.

Q. 52. At a temperature of, say, 160 degrees, it was your experience that irrespective of the proportions of catalyst to oil, irrespective of the hydrogen pressure, and irrespective of the degree of agitation of the mixture of catalyst and oil, a partially hydrogenized product with a melting point of, say, 42, would, perforce, have a high percentage of olein and a low percentage of linolin?

A. Yes; the olein would always be in very much greater proportion than the linolin.

Q. 53. And would it follow, necessarily, that a product having a melting point of, say, 42, produced by partial hydrogeniza-
322 tion, would have approximately the glycerids in the proportion of 20 to 25 per cent. saturated fats, 60 to 70 per cent. olein, 5 to 10 per cent. of linolin and lesser saturated fats and glycerids?

A. Well, I am not able to say at 42 melting point what the proportion would be; but my opinion is now that that is somewhat harder than would be indicated by 25 per cent. solids; the solids would be in greater proportion than that.

Q. 54. Have you made any research investigations as to lard?

A. Yes.

Q. 55. One of the notable characteristics of lard is the high proportion of olein therein contained, and the relatively low proportion of linolin, is it not?

A. Yes.

Q. 56. And in lard, say, prime steam or kettle-rendered lard,

would you find that you would have approximately 8 per cent. linolin, 68 per cent. olein, and 24 per cent, saturated fats?

A. The saturated fats are in greater proportion than that, and the olein is less, in my opinion.

Q. 57. I had taken my figures from Lewkowitsch, and I wondered if your opinion is, that his figures are approximately correct?

A. If I remember seeing a number of Lewkowitsch's figures, where he gives the liquid iodine value, and the iodine value of the original lard, he cannot confirm his figures.

Q. 58. Then he cannot confirm his figure by the linolin tetra-bromide method?

A. By the iodine value. I do not think he used the tetra-bromide test. There is one case I remember where he does use the tetra-bromide method, but in a later edition of his book he says that is incorrect, that it would not possibly have been so.

Q. 59. Just what was your method in separating the
323 liquid fatty acids? I would like to have you give me that in detail, if you will?

A. It is a well-known method, the lead-ether method. I have not the details here, but it is one which is published in practically all the text books, Lewkowitsch, for instance, wherein the lead soaps are first made; then they are thoroughly dried; that precipitate—they are all insoluble in the solution, that is, in the water solution; they are dried in order to as much as possible get rid of all water; then they are dissolved in ether; a certain proportion of ether is always taken, because there is some slight solubility of the soluble fats, so that it is always necessary to take a given quantity of ether; that detail I cannot recollect just at this time. That was the method. They are then separated and one on the one hand weighed, and the other evaporated and weighed, usually broken up, so as to get the fatty acids, so that if there isn't any of the soap lead present in any way—although they are supposed to have been washed first.

That method was rather long and laborious, and we thought open to the fault that lead soap oxidized very quickly, so that the liquid fats were subjected in this process to oxidation. So afterward we modified that and we do not now separate them quantitatively; we only take, after we get the ether solution we only take a portion of that and evaporate that in an inert atmosphere, an atmosphere which excludes all oxygen, so that the liquid fats have no chance of oxidation. From that we weigh our proportions or take out iodine value. In that way we can do it very quickly, and since we have adopted that method, we have done it almost as a routine matter.

Q. 60. What was the method you followed in 1910?
324 A. It was the regular method as laid down in the text-books.

Q. 61. Was that same method followed by you in 1912 also?

A. No, somewhere along in the summer of 1912 we adopted the method which I have just spoken of as the one now in use.

Q. 62. What ether did you use?

A. We used the regular ether that is used, the antiseptic ether.

Q. 63. Did you use Squibbs ether?

A. Yes.

Q. 64. Did you dehydrate it?

A. We always took precautions to see that it was up to standard.

Q. 65. How did you dehydrate it?

A. With anhydrous sodium sulphate.

Q. 66. Did you use carbon dioxide as the inert atmosphere?

A. Carbon dioxide in some cases; in other cases we used the common gas, the natural gas.

Q. 67. You mean the natural gas you get out here in Ohio?

A. Yes.

Q. 68. What method of ascertaining the iodine value did you follow?

A. What was known as the Wijs method.

Q. 69. That is the same method that is set forth in Bulletin Number 107 of the Bureau of Chemistry of the Department of Agriculture?

A. No, I think that is the Hubl and Hanus method in there; but that is the same method as published in Lewkowitsch.

Q. 70. You are quite right, Mr. Morrison—I find I was wrong in thinking that the Wijs method was given in Bulletin Number 107.

A. Yes.

Q. 71. But I find that only the Hubl and the Hanus methods are given?

A. Yes.

Q. 72. What was the essential distinction between the Wijs and the Hanus method? Wijs has a different method of making up this tri-chlorid of iodine; the others have a different method of
325 making up their solution. There is not much difference between them.

Q. 73. The results would check within a point or two?

A. The results would check within a point or two—should check within a point or two, that is. The advantage of the method laid down there, more than any other, is the speed. I think that is about the only real advantage claimed for it.

Q. 74. In the last answer you are referring to the methods set forth in Bulletin Number 107?

A. Yes.

Q. 75. Would you be so good at tomorrow's session as to prepare and let me have an exact statement of the method that you follow in separating the liquid fatty acids, and also in ascertaining the iodine value of the oil or fat?

A. I will, sir.

Q. 76. Have you found there is any great variation in cottonseed oil, of the "summer yellow" or "summer white" oils, as regards the iodine value?

A. In the summer oils, there is not a great difference. In my opinion there is a difference between those of the southern belt and those of the northern belt. Those of the southern belt seem to mature

and have a higher amount of saturated fats than those of the northern portion of the belt.

Q. 77. What was the range of the iodine values of the cottonseed oil from the northern and southern belts?

A. Oh, I should say, probably from 107, for the southern oils—for the extreme southern oils—up to 112 for the extreme high ones in the northern belt.

Q. 78. What would be the extreme ranges of iodine values of the liquid fatty acids of those oils?

A. I can't tell you that; I never ascertained that.

Q. 79. The average iodine value of the liquid fatty acids of
326 the summer cottonseed oil, is approximately 147 to 148?

A. Approximately—Liquid fatty acids? Yes.

Q. 80. Prior to your assuming charge of the chemical superintendency of Procter & Gamble Company, who was the chemical superintendent?

A. We had none. It was a position created at that time.

Q. 81. So that before that time, and after you came back to Procter & Gamble Company in the spring of 1908, you had as much charge of the laboratory as anybody did, I take it?

A. No; I wouldn't say that. I gave no orders whatsoever. All I did was like anybody else—when I wanted anything done, I sent it up to the laboratory and asked to have certain determinations made.

Q. 82. What do you understand to be the average titre of lard?

A. Of lard? I would consider lard as about 39, I think, 39 to 40; they vary considerably, I think.

Q. 83. Ranging approximately from 36 to 41.5 centigrade?

A. Well, I have never seen any with those extremes; I have never had anything to do with it with those extremes; any I have had anything to do with, were less extreme than those figures.

Q. 84. Leaf lard would have a titre of about 41.5 centigrade, would it not?

A. Well, I don't think I have ever seen one as high as that, myself.

Q. 85. In these partially hydrogenized products which you were investigating prior to November, 1910, did you notice any correlation between the titre and the melting-point of the partially hydrogenated material?

A. No, sir.

Q. 86. In 1912, about November 20th, there was sent to the Patent Office, in connection with Mr. Burchenal's applica-
327 tion for Letters Patent, which resulted in Patent No. 1,135,-351, a statement in which the specifications of the patent application were amended by setting forth that the partially hydrogenized product therein described contained certain percentages of linolin and olein and saturated fats. Did you make the determinations which resulted in those figures?

A. No, sir.

Q. 87. Do you know who did?

A. No, I do not.

Q. 88. Then on March 6, 1915, in connection with the same application, there was filed an affidavit, in which this statement was

made: "A re-determination of the melting-point and titre, corresponding to the iodine value of 55 to 80, in partially hydrogenized cottonseed oil, results as follows: For an iodine value of 55, the titre is 42 and the melting-point 40 centigrade; with an iodine value of 80, the titre is 35 and the melting-point 33 degrees centigrade." Did you make that re-determination, Mr. Morrison?

A. No, sir; I did not make that determination.

Q. 89. Do you know who did?

A. No; I do not remember at this time.

Q. 90. Who was in the laboratory at that time and who would have been likely to make that re-determination?

A. These are just titres, are they not? Well, I can't say now who it was. If it were one of the routines, I can get that information, though I don't know that it would be of value to anyone; if it were one of the routine boys, he would not know what these things were. Everything is sent to our laboratory under what we call the "Blind System," only sent there under numbers, by numbers; only the person who sends them there knows what they are.

Q. 91. So that the person who sends them there does not
328 know who actually makes the determination, or does not check the results?

A. No, sir; he gets a report from the laboratory, the same as anybody else getting a report from a laboratory, from a chemical laboratory.

Q. 92. Is it a fact that a partially hydrogenized cottonseed oil which has an iodine value of 55, has always a titre of 42 and a melting-point of 40 degrees centigrade, so far as your observation goes?

A. No; they will vary, of course, one way and another.

Q. 93. And it does not necessarily follow that according to your observation, a partially hydrogenized oil which has an iodine value of 80 degrees, would have inevitably to have a titre of 35 degrees and a melting-point of 33 degrees centigrade?

A. Not exactly.

Q. 94. I notice that in that re-determination the titre is given as 42 degrees and the melting-point 40 degrees centigrade, of one product, and with another product the titre is 35 degrees and the melting-point is 33 degrees? Have you found that to be your general experience, that the melting-point was lower than the titre in these hydrogenated oils?

A. There is a point there at which they cross each other. The titre, as you understand, is quite a different thing from the melting-point. The titre is determined on the fat acids, while the melting-point is on the glycerids, as usually understood in these figures here. In this case here, the titre means on the fat acids, and melting-point on the glycerids, and they have quite different physical properties. Where you take the melting-point is 33 degrees? Have you found that melting-point of a sample glycerid is higher than
329 the fat acids, the component fat acids; whereas, the melting-point of a mixed tri-glycerid is lower than the fat acids; so that those things vary; so that where you are partially hydrogenizing a product, after awhile you are getting certain products

in there which are largely tri-glycerids. There is a point at which they vary; so that you cannot answer that question without preparing charts and one thing and another.

Q. 95. In order to make it clear on the record, I would be very glad, Mr. Morrison, if you would tell just what "Titre" is?

A. The titre is determined on the fat acids of a fat, or oil; and it is that point where the heat of crystallization overcomes that of radiation; and by the rise and fall of the temperature—by the rise and fall of the thermometer—at that point, the point is determined. Did you ask for the difference?

Q. 96. No, I wanted to know what it was? In general, it is the point at which the fatty acids solidify?

A. Yes; are solidified. They solidify through quite a period there. They begin to solidify—we get what we call a cloud—we get a cloud in there, but that is not the point; we have to watch the thermometer until we get a certain point; there is a certain point where that commences, so that they keep on after that; but there is a certain point in there where the heat of crystallization overcomes the heat of radiation, or where the heat of crystallization and of radiation overcome one another, and it is that we take. It does not mean anything—it is just the point—it doesn't mean anything to the—you can't tell anything of the physical or of the chemical qualities of a compound from that.

Q. 97. And it is during this solidifying process, when the heat of crystallization overcomes the heat of radiation, that the temperature remains stationary for a few seconds at the high point,
330 before again falling, and that high point is taken as the titre point?

A. As the titre point, yes.

At this point an adjournment was taken to the following morning, Tuesday, at ten o'clock, October 24, 1916, at which time the further taking of the depositions proceeded as follows:

Tuesday Morning Session.

October 24, 1916.

The taking of depositions was resumed pursuant to adjournment. Counsel present as heretofore noted.

Thereupon, HARLEY J. MORRISON resumed the stand and testified further as follows:

Examined by Mr. May:

Q. 98. Mr. Morrison, who had charge of the analytical laboratory of Procter & Gamble Company during the years of 1909 and 1910??

A. Mr. Zoal had for part of that time; whether he was there all of 1909, I cannot say. I can look that up. I think there was a

Mr. Aedler, of our Kansas City plant, there, for about three months in 1909, though I am not positive about that now.

Q. 99. Who was it in the laboratory that made the analyses of these hydrogenated products and mixtures containing hydrogenated products?

A. The iodine values, you are speaking of?

Q. 100. The iodine values and the fatty acid determinations and separation?

A. There were various analysts doing that; the titre was done by one boy; the fat acid was possibly done by him, or pos-
331 sibly by another, and the iodine was usually done by a third man. The work was all divided up in that way; no one man does the whole.

Q. 101. Did these men, so far as you know, know upon what they were making analyses, or securing determinations?

A. No; our method with all things that came into the laboratory, was, that they were "Blind marked."

Q. 102. When the report is made by the analytical laboratory, does the report give the name of the person who makes the analysis, or who secures the determination

A. No; it is just—the report would be sent back to the department that sent it up, under their mark.

Q. 103. So that there is no way of ascertaining who made any particular analysis, or secured any particular determination of these hydrogenated products or mixtures, during the years 1909 or 1910?

A. I think there would be no way of telling, whatever. I was going to say that possibly in some reports there might be the handwriting—but that would not be true, because they were all entered by a clerk.

Q. 104. Did you personally make any of the iodine value determinations of these products during that period?

A. Not personally, no.

Q. 105. Did you see it done?

A. Well, in a general way—I have just been in the laboratory and out—but not standing over the man the whole time he was making it, or anything of that sort.

Q. 106. But you were there frequently, so that you knew just what the procedure was in ascertaining the iodine value of the oils and fats that were being hydrogenized

A. After I became Chemical Superintendent, not before.

Q. 107. Did you effect any change in the methods of ascertaining the iodine values after you became Chemical Superintendent?

332 A. Yes; sometime after, we changed the method of getting the liquid fatty acids, not of getting the iodine values.

Q. 108. Now, if I understood you correctly, from the spring of 1909 until you were appointed Chemical Superintendent in December, 1910, while not directly connected with the chemical laboratory in a supervisory capacity, you were doing research work in connection with these oils or fats which had been completely or wholly saturated, or mixed with other oils, and were in constant communication with Mr. Anderson and Mr. Burchenal?

A. Yes.

Q. 109. Now, just what were the experiments that you personally were making in connection with these matters, during 1909 and 1910?

A. That is, the experiments on the hydrogenated product only?

Q. 110. Yes?

A. That is what you refer to?

Q. 111. Yes

A. Mostly to get some method of getting it nice and smooth, for instance; also, we would try various mixtures to see if we could not prevent Flake White, the compound, from losing the air. You understand, all compounds, where they are beaten up—compounds are beaten up, and after awhile they lose that air and become semi-transparent and have a greasy look; tried lots of experiments along that line to see if we could not put in something that would prevent that.

Q. 112. Did you succeed in doing that?

A. Not where we used a hard fat, in the two extremes, a hard fat and the oil.

Q. 113. So that the general consistency of this compound, whether it was lard-like, or like vaseline, depended upon the aeration of the compound by the picking operation, after the compound had been chilled on the chilling roll?

A. Just done in the way that all compounds were made
333 up at this time.

Q. 114. Whether or not the mixture presented the appearance of a vaseline-like mass, or whether it presented the appearance of a lard substitute, and more or less like lard, depended upon the operation of beating and upon the operation of chilling? Is that the fact?

A. Well, I don't think that you can get it into that vaseline condition, right at the start. That comes after it has been beaten up and loses the air. I never tried just chilling it rapidly; I don't know just what that would do; but that vaseline appearance always comes afterward, in my opinion.

Q. 115. That, you think, is due to the fact that the mixture has lost some of the air that had been beaten into it during the picking operation?

A. Yes.

Q. 116. So that if in the original beating operation you did not get that air into the product as well as you should, it would have a vaseline appearance to start with, would it not?

A. Well, it might; I don't know. I have put the compound under a vacuum immediately after it was made and drawn out all that air, and then it gives that vaseline appearance. That is the reason, in my opinion, that loss of air, that occasions the appearance.

Q. 117. I think you and I agree on that point, Mr. Morrison, if I understand the procedure correctly; because it depends, as I am informed, upon the way in which the mixture is beaten, as to just what the appearance of the mixture will be?

A. Yes.

Q. 118. Now, I asked you yesterday if you would be good enough to bring in your precise method of ascertaining the iodine
334 values or numbers, of the fats and oils and the liquid fatty

acids; also, the precise method that you follow in the separation of the liquid fatty acids?

A. I did not understand you, then, because I have brought down here a method of obtaining the liquid fatty acids. We get the iodine values as laid down in Lewkowitsch, with the exception that I think both the last edition and the edition before, are not quite correct in the figures given there, the figures for calculating; but we used that method just as it is laid down there. This (indicating paper), is our own method of obtaining the liquid fats.

Witness hands paper to counsel.

Q. 119. Mr. Morrison, I hand you a statement giving a method for the separation of the liquid fatty acids, and will ask you to read that carefully and to state whether or not you would say that that is an accurate and standard method of effecting the separation?

A. (After reading statement:) Well, I have not tried this method, and there are a great many details in it which I would hardly be prepared to say were necessary, or whether they would bring any errors.

Q. 120. What is your answer as to whether that is a correct method of effecting the separation, or not?

A. I am not prepared to say, without having tried it, without having gone over it.

Q. 121. What should you say were the possibilities of error that might arise in the procedure?

A. Well, the time seems to me to be considerably longer than necessary; and while precautions are taken to keep the liquid fatty acids from oxidation, I think that there is a possibility of their changing.

335 Q. 122. To what particular time do you refer, Mr. Morrison?

A. Well, it goes all through into—it stands here for sixteen to eighteen hours, that is, in a solution of ether—I don't think that that would be detrimental. This point of drying the fatty acids for twenty-four hours appears to me to be a source of possible error.

Q. 123. But if that drying takes place in an inert atmosphere, how would there be any opportunity then for trouble arising?

A. Well, if the atmosphere were kept inert all the time, it would be possibly all right; but for twenty-four hours, it is pretty hard to watch it; it has to be over night, at least; there is a possibility of error getting in during that time, I should think.

Q. 124. But if the procedure is carried on strictly as stated, so that the atmosphere is inert during that period of drying, then there would be no likelihood of difficulty arising because of oxidation?

A. No; not if you had kept the conditions right all the time.

Q. 125. Of course, in asking you the question I am assuming that the procedure, as outlined in the statement, is strictly carried out without any deviation or without any chance of anything occurring that is not stated in the description of the method; and if that is done, would you say then that it was an accurate way of effecting a separation of the fatty acids?

A. Yes; under conditions as you state them, if every condition

was carried out there, I think it would. I have not tried it, as I say, but I am willing to admit that I think it is a fair method.

Q. 126. Under those conditions?

A. Yes.

Mr. May: In order that it may appear of record just what
336 the method is, which I have asked Mr. Morrison to examine in these immediately preceding questions, I will ask the examiner to copy into the record this statement, the same being entitled, "method for the separation of liquid fatty acids."

The said statement is hereinafter set forth by true and compared copy, as follows:

"Method for the Separation of Liquid Fatty Acids.

Weigh out 20 grams of the fat into 300 cc. Erlenmeyer flask. Add 180 cc. of alcoholic potash (40 g. KOH per liter of alcohol redistilled from KOH) and boil until completely saponified, then until ¾ alc. is gone. Add 100 cc. water and neutralize with glacial acetic acid, using phenol-phthalein as an indicator; come back to end-point with N/2 NaOH solution.

Measure out into a 500 or 600 cc. Erlenmeyer flask 120 cc. of 20% lead acetate solution and 100 cc. of distilled water, and bring to boiling. If the neutralized soap solution has by this time crystallized out, warm the flask until contents are liquid, then add carefully to the boiling lead acetate solution; after boiling for about two minutes, remove flask from source of heat and after a few minutes cool in running water.

Prepare 4-inch funnel, with 25 cm. paper, pour the liquid contents of the flask into the filter paper; when the liquid has run out of the filter paper, wash the flask twice with 50 cc. each time of distilled water, filtering the washings, then twice with 25 cc. each
337 time of 95% alcohol, filtering the washings and taking care to wash the sides of the paper with alcohol.

When the alcohol has entirely drained from the funnel, dry the filter paper free from alcohol and transfer the precipitate to the flask which has been allowed to drain free from alcohol for 10 minutes. Add 220 cubic centimeters of ether (prepared as described in note below).

Toward the latter part of the afternoon, boil the ether and lead soaps under a reflux condenser for one hour. When cool, cork well and allow to stand from 16 to 18 hours at a temperature of between 7° and 10° C.

At the end of this time, filter off the insoluble soaps in a 4-inch funnel kept covered with a watch glass, wash the flask and soaps with 25 cubic centimeters of ether, and add washings to filtrate. Pour this ether solution of soluble soap into 150 cubic centimeters of a hydrochloric acid solution (made by adding one part of concentrated hydrochloric acid, specific gravity 1, 2, to four parts of water) in a 500 cubic centimeter separatory funnel. Cork the separatory funnel and shake until the ether layer becomes practically clear and

colorless. Draw off the acid solution containing the lead chloride, and wash the ether with portions of sodium chloride solution (125 gr. per liter), until three drops of half normal alkali will neutralize the last washing using phenol-phthalein. Separate the water layer as completely as possible, and pour the ether solution of liquid fatty acids into a clean flask.

Place the flask in a water bath and connect it with a hydrogen generator and a condenser. Pass a gentle stream of dry hydrogen, free from oxygen, below the surface of the solution, and dis-
338 till off the ether. Finally, boil the water bath, and heat the liquid fatty acids until no odor of ether can be detected. Filter in an atmosphere of dry hydrogen, free from oxygen, and dry by exposing the liquid fatty acids in a Petri dish over concentrated sulfuric acid in an atmosphere of hydrogen for 24 hours. The iodin number is determined on this sample, as usual.

Note Preparation of Ether.

Standard U. S. P. ether is washed five times with portions of water, each one equal to 10% of the volume of the ether. Allow the ether to stand for 16 hours, with 20% by weight of fused granular calcium chloride, such as is used in desiccators. Decant the dried ether through a filter, and distill."

Q. 127. You have produced at my request a description of the method which has been followed at the laboratory of Procter & Gamble Company for effecting the separation of the liquid fatty acids, and I will ask you to read that method into the record as your answer, so that it may appear of record in this case?

A. I have done so and it is as follows:

339 "Form A-838. Established 1837.

The Proctor & Gamble Co.

Cincinnati, U. S. A.

Trade Mark. Incorporated 1905.

Please Address Reply to Ivorydale, Ohio.

The Proctor & Gamble Co.

Ivorydale, Ohio.

Method.

Iodine Value on Liquid Fatty Acids.

Place 5 cc. of fat in a ½ liter Erlenmeyer flask, add 60 cc. alcoholic potash (N/2) and place on steam bath ½ hour. Add 1 cc. phenol-

phthalein, neutralize with acetic acid till pink has disappeared, then bring back to a faint pink with N-alkali. Add 300 cc. water and 25 cc. of a 20% solution of lead acetate. Cool and shake occasionally. If precipitate coagulates, filter through a cloth, using a suction pump and Buchner funnel. Wash once and transfer precipitate to flask. If precipitate does not coagulate, add more lead acetate, cool, or shake longer. If not coagulated, it is difficult to filter. Now add 100 cc. ether to flask and shake, warming on a steam bath to a slight boil. Shake until disintegrated. Draw off any water which may settle out. Let stand in cold water ½ hour. Now filter into a separatory funnel, collecting only 50 cc. of filtrate in order to
340 save time and avoid prolonged exposure to air. Add 30 cc. dilute HCl (1:1) to filtrate and shake out the lead chloride, add water and draw off the lead suspension. Repeat the acid wash a second and third time. Omit the water following the second acid wash. Now continue to wash the ether solution until free from acid. Filter the ether solution into a small round bottom flask. Evaporate ether in a current of gas and expel any water and alcohol from the fatty acids by means of a vacuum pump, heating the flask if necessary. Cool the fatty acid before admitting air. Determine the iodine value on the stock immediately."

A. (continued by witness): Mr. May, I have worked out the problem which you gave me in Question 44 yesterday a little more carefully since the adjournment last evening; and in a cottonseed oil having an iodine value of 110, in which the iodine value of the liquid fatty acid was 147, I find the percentages of the component fatty acids to be as follows:

48.6 Per cent. Linolic Acid.
29.6 " " Oleic "
21.8 " " Saturated Acid.

Q. 128. Now, the glycerids in the oil would be in substantially the same proportions, would they not?

A. Well, they are probably mixed glycerids; that is, the saturated fats are not all connected with the same molecule—one and the same molecule of glycerin.

Q. 129. But in the cotton oil the mixed glycerids would, so far as the olein, the linolin and saturated glycerids are con-
341 cerned, be in substantially the same proportion as the fatty acids which you have given?

A. No; I do not think that that is quite the case—not to my mind.

Q. 130. What do you figure, then, the proportions of olein, saturated glycerids, linolin and lesser saturated glycerids to be in that cottonseed oil?

A. There is no way of telling from this how much linolin, how much olein or how much of the palmitin or stearin exists there, because one molecule may be connected with two of the linolin, in the glycerin, making it a mixed glycerid. There probably exists in cottonseed oil a greater proportion of mixed glycerids than there are of the simple glycerids.

Q. 131. Are you not able to calculate, roughly, from the proportions of the fatty acids contained in the oil, what the proportions of the glycerids would be?

A. No, sir.

Q. 132. That is, you mean only on the assumption that they are pure tri-glycerids?

A. I said no; my assumption is that they are mixed glycerids—mixed tri-glycerids. If they are simple tri-glycerids, why, then they are substantially in these proportions.

Q. 133. Then prior to November 10, 1910, were you unable to ascertain the proportions of olein, linolin and saturated fats in cottonseed oil and in hydrogenized cottonseed oil?

A. At that time, as now, we only ascertained the proportions of the fat acids, and not of the glycerids.

Q. 134. And that has been found to be true in the chemical research work that has been done for Procter & Gamble Company at the Procter & Gamble Company laboratories?

A. Yes.

Q. 135. Have you ever analyzed an edible cottonseed oil,
342 such as is indigenous to this country, in which you found the component glycerids to be in the following proportions, to wit: saturated fat, 17 per cent.; olein, 46 per cent., and linolin, 37 per cent.?

A. No; I think that that is not quite the proportions that are usually found.

Q. 136. Those proportions would indicate a very low iodine value of those fatty acids?

A. Yes.

Q. 137. Whereas the liquid fatty acids of cottonseed oil range from /47 to /48 or /50?

A. Yes; about /47 to /48 in my opinion.

Q. 138. I notice that in the Burchenal Patent, No. 1,135,351, cottonseed oil is described as having the proportions of the component glycerids which I gave in my previous question; can you explain anything about that statement in the patent?

A. The same which we called "Original," or, in this case, cottonseed oil, was taken from the hydrogenating machine and in all probability was mixed with the previous batch.

Q. 139. Why did you draw it from the hydrogenating machine?

A. In order to get an exact sample of the oil that we were working on.

Q. 140. Why did you not test it before you put it in the machine?

A. I don't know why we didn't do that; we took the sample just out of the machine, and as we went along we kept taking samples from time to time.

Q. 141. What was the purpose of taking these samples from time to time?

A. To ascertain if there was any point where there was a better proportion of linolin and olein—I use those words in a general sense—than at another.

Q. 142. In other words, you were watching the progress of the reaction and noting the change of linolin to olein and of olein to stearin, in the product?

A. Yes; this was experimental.

343 Q. 143. When was that done?

A. I think that was done somewhere in 1911 or possibly early in 1912.

Q. 144. And it was at that time, in 1911 or 1912, that you got the proportions of the component glycerids in the partially hydrogenized product that are described in the specification of this patent in question, No. 1,135,351?

A. I think that figure is the average of several; and whether all of these determinations were made at that time, or previously, I am unable to say now.

Q. 145. Who would know about that?

A. Well, I suppose I ought to know; but I do not. I figured it out—I made those figures.

Q. 146. Well, in point of fact, really, were not those figures made immediately prior to November 20, 1912, when the amendment was made to the specification by the insertion of those figures?

A. No; the analyses were not made immediately before this. They were taken from some memoranda I had of analyses taken over a period of time previous to this.

Q. 147. How long a period?

A. Well, I am unable to say. I picked them out of some memoranda I had, and possibly over two years; I don't know that; I can't say.

Q. 148. You cannot tell just when it was done?

A. I cannot say definitely.

Q. 149. Have you those memoranda now?

A. No, I have not.

Q. 150. Have they been destroyed?

A. Or lost; I would not destroy them, but I have mislaid them some place. I have looked for them.

Q. 151. You cannot say positively from recollection that that was done prior to November 10, 1910, can you?

A. I cannot say positively; no, sir.

344 Q. 152. So far as your observations go, have you found that with a given temperature of hydrogenization, there is any variation in the proportions of the constituent glycerids in a semi-solid, partially hydrogenized oil, where there are marked variations in the proportion of catalyst to oil, pressure and degree of agitation of the oil and catalyst, during the hydrogenization?

A. You used the expression here, "During the hydrogenization." Of course, it starts off as a raw oil, the proportions are changing from beginning to end of the operation.

Q. 153. I will put the question in another way: Assuming that you were carrying on simultaneously two parallel trials; in both cases you are preserving the same temperature during the operation of hydrogenization; in one case, however, you are using approximately ten per cent., by weight, of nickel catalyst to the oil, and you are agitating the oil at a fairly rapid rate and you have a pressure of hydrogen, say, of twenty pounds.

Now, in the second case you have only one-tenth of one per cent.

of catalyst, by weight, of the oil; the agitation is relatively slow and the pressure is, say, five pounds.

Would the two products resulting from those hydrogenations—or when the two products resulting from those hydrogenations have reached a semi-solid condition, say, with a melting point of thirty-six, would you find in the two products the same proportions of the component glycerids?

A. In our experience, using a very much smaller quantity of catalyst, as a maximum, than you have stated, they would be approximately in the same proportion. I have never used ten per cent.—that is too high.

345 Q. 154. What is the greatest amount of catalyst that you have used in hydrogenizing these products, to wit, a vegetable oil, experimentally, to get an edible product, experimentally?

A. I don't believe we have ever used over one per cent.

Q. 155. In actual practice, in making an edible product, what proportion of catalyst to oil do you employ, speaking in terms of nickel alone?

A. We use approximately one-tenth of one per cent. for edible oils.

Q. 156. Had you ever practically produced, at the Procter & Gamble Company, prior to November 10, 1910, a semi-solid, partially hydrogenated cottonseed oil product, which did not have a high proportion of olein, say in excess of fifty per cent., and a low proportion of linolin?

A. I never recollect having such a product.

Q. 157. All of the hydrogenized or partially hydrogenized oil products which were produced at the Procter & Gamble Company's plant or laboratory, prior to November 10, 1910, were accomplished by mixing a catalyst consisting of finely divided nickel chemically precipitated on Kieselguhr, and in a state of fine division, with oil, agitating the mixture to keep the catalyst in suspension, and bringing the mixture of catalyst and oil in the presence of hydrogen, under pressure, in a temperature of, say, 155 to 160, or thereabouts?

A. Prior to November 10, 1910, I cannot say. Those experiments, or the work which I am familiar with, were produced in the way you speak of.

Q. 158. That is to say, it was produced by what might be loosely called the "Batch Process?"

A. Yes.

Q. 159. Mr. Morrison, you referred us to some laboratory
346 experiment in connection with the hydrogenization of oil. Was the apparatus which was used for this hydrogenization the previous apparatus that Mr. Kayser had had made for him during the first part of 1908?

A. The apparatus that we now use and have been using for a long time, ever since Mr. Kayser left, was our own design, and not Kayser's.

Q. 160. That is, in the laboratory?

A. The laboratory, yes.

Q. 161. And it is not a converter or hydrogenator of the horizontal type, but one of the vertical type?

A. We have two, one a horizontal and one a vertical. We perform most of our laboratory experiments on the vertical.

Q. 162. Now, the horizontal hydrogenator, was that like the one that Mr. Kayser used in 1908?

A. Substantially.

Q. 163. In that apparatus the hydrogen is admitted to the hydrogenating chamber above the level of the oil?

Mr. Allen: That is Kayser's you mean?

Q. 164. Yes; I am referring to the apparatus which was like Mr. Kayser's.

A. I am trying to recall now—I think not—I think in the one we are using now it goes in at the bottom. I am not quite certain about that. I see the thing pretty nearly every day, but I don't just recollect now.

Q. 165. In the vertical machine the hydrogen is admitted at a point below the level of the oil?

A. Yes, at the very bottom.

Q. 166. In the actual commercial operation of hydrogenizing oil, prior to November 10, 1910, there were only hydrogenators of the Kayser type in your plant, were there not?

347 A. I cannot say now, as to whether we had installed vertical machines at that time or not; I don't recall.

Q. 167. Was not the vertical machine installed about 1912?

A. After refreshing my memory with the former deposition in the Southern Cottonseed Oil Company case, I believe now that we did first use that in the spring of 1912.

Q. 168. And in all of the hydrogenization that was carried on, either in the laboratory or in the plant of the Proctor and Gamble Company, prior to November 10, 1910, the catalyst employed was nickel chamically deposited on kieselguhr, is that a fact?

A. Yes.

Q. 169. Who was actually doing the experimentation in hydrogenizing oils in the laboratory?

A. At what period?

Q. 170. Prior to November 10, 1910?

A. Mr. Kayser, up until he left in 1910, and after that Mr. Graff, with the assistance of boys who were employed in the laboratory.

Q. 171. In actual practice in the hydrogenization of oils, in 1909 and 1910, for making edible, what proportion of nickel to oil did you use?

A. For a part of that period we used possibly one per cent. of nickel, using it over several times. Later we reduced the amount to approximately one-tenth of one per cent. and discarded the catalyst.

Q. 172. Regarding the matter of the chemical constituents of commercial lard, would you feel safe in saying that one of the chemical characteristics of lard is, that it contains in excess of 50 per cent. of olein, and a smaller proportion of linolin, even though the saturated fats might be in excess of 24 per cent.?

A. It contains a small proportion of linolin; but whether
348 or not it contains in excess of 50 per cent. of olein, I am not quite clear now. I would have to refresh my memory on that.

Q. 173. In answer to Question 50, which inquired about the methods used at Proctor and Gamble Company prior to 1910, in separating the liquid fatty acids, you said that it was the regular method laid down in the text-books. To what text-book do you refer?

A. I think Lewkowitsch has it, but I am not positive which one it is; it is laid down as the lead-ether method in many text-books.

Q. 174. Was that the Lane method?

A. I do not recollect now.

Q. 175. Before dropping entirely the matter of the titre point of the fats and oils, I shall ask you the following question so as to make is as clear as possible to the Court just what the titre is, and see if you agree with me:

The critical melting point and solidifying point of water, for instance, is a sharp, unvarying point; whereas, in a mixture of glycerids for example, such as in oil or fat, there is no critical melting or solidifying point, and that is true also of mixed fatty acids, as in oil or fat; hence, in ascertaining the titre of the mixed fatty acids, the substance is placed in a vessel and is permitted to cool, at the same time being stirred, the cooling being of course, due to the radiation of the contained heat; by observing the variation in temperature it is noticed that the temperature reaches a certain low point, due to the radiation of the heat, and stops momentarily, because of the heat of crystallization. The heat of crystallization causes the temperature of the mixed fatty acids then slightly to rise, until the heat of crystallization balances the heat of radiation, and at this point the temperature remains stationary for a few seconds, say ten seconds, after which the temperature again drops.

349 Now, it is that point where the heat of crystallization balances the heat of radiation, that is taken to be the titre point?

A. Yes.

Q. 176. So that, in view of the fact that there is no fixed melting point and no fixed solidifying point of any given fat or oil, and it is difficult to ascertain these melting and solidifying points, the titre may be regarded as a fairly accurate standard in determining the solidifying point of the fatty acids, and may be referred to as such, in a general way, because it is a sharp or critical point?

A. It is a point which is called constant; but it only refers to fat acids, and not to the glycerids.

Q. 177. Can you state what would be the proportion of the component fatty acids in a lard substitute having the following characteristics: Consisting of 85 per cent. cottonseed oil, 15 per cent. of cottonseed oil hydrogenized to have an iodine value of 20 and a titre of about 55 degrees centigrade; the said lard substitute being a semi-solid having an iodine value of 95, a melting point of 42, and a titre of about 36?

A. I should state it was approximately 30 per cent. solid fatty

acid, 42 per cent. linolic acid and 28 per cent. oleic acid. This is just roughly calculated.

Q. 178. Suppose that the hydrogenated ingredients had only an iodine value of 8 or 9, and that 10 per cent. thereof were used with 90 per cent. of cottonseed oil; would the resultant product be a semi-solid having an iodine value of 95, a melting point of 42, and a titre of about 36? Not exactly, but somewhere in that neighborhood.

Q. 179. How far off would the product be from one having those constituents given in the last part of my question?

A. Well, the iodine number would be a little higher; how much it would affect the melting point and the titer I am unable to
350 say, but not a great deal, not as much as the iodine number.

Q. 180. What do you think the iodine number would approximately be?

A. Probably 98.

Q. 181. It might be more than that?

A. It might be a little bit more; I am not positive about that.

Q. 182. Prior to November 10, 1910, was any of the cottonseed oil treated by hydrogenization in the laboratory of Procter and Gamble Company other than by the use of an apparatus substantially as shown in the Kayser patent, No. 1,008,474?

A. I do not recollect, but I don't think so.

Q. 183. And up to the date mentioned in my last question, whatever hydrogenized oil was commercially produced at Procter and Gamble Company's plant, was produced with the use of an apparatus substantially as shown in the patent last referred to? Is that the fact?

A. I think so, although I am not clear on that point.

Q. 184. Does the doubt arise in your mind from the particular construction of the agitators, or paddle wheels, or at some other part of the apparatus?

A. I think that the paddles have been changed somewhat; but at what period I do not know.

Q. 186. Do you mean that some paddles were used which were not made of gauze or other foraminous material?

A. The gauze was discarded.

Q. 187. And what was used in lieu thereof?

A. For a long while, just the frame upon which the gauze had been supported.

Q. 188. In other words, you used what might be called "Squirrel cage" agitators?

A. That is right, yes.

Q. 189. These consisted of parallel rods which are rotated about a common centre?

A. Yes.

Q. 190. Did you see the sample of compound which was
351 sent by Mr. McCaw to the Procter & Gamble Company in May 1908?

A. No, sir.

Q. 191. Did you see any that was sent to the Procter & Gamble Company in the summer of 1908?

A. No.

Q. 192. What is the color of raw cottonseed oil?

A. Sort of an orange color, consisting of red and yellow.

Q. 193. And is raw cottonseed oil, crude cottonseed oil?

A. Well, I referred to refined cottonseed oil. Crude cotton oil is very much deeper in color; it would almost be called a ruby color.

Q. 194. Would you understand that raw cottonseed oil would be crude cottonseed oil?

A. No; we usually refer to it as—I suppose it could be used either way.

Q. 195. Is oleic acid an edible substance?

A. I don't know—I never tried it.

Q. 196. Is it edible when hydrogenized?

A. The oleic acid?

Q. 197. Yes.

A. Stearic acid, you mean?

Q. 198. Yes.

A. I have tasted it; but I don't know whether it is edible or not.

Q. 199. You would not personally consider either oleic or stearic acid to be edible, would you?

A. For my own purposes?

Q. 200. For any purpose?

A. Oh, I know people, I guess, that eat it—they eat Limburger.

Q. 201. To what temperature can cottonseed oil be raised before smoking?

A. It depends on so many conditions—the light has to be of standard density before you can answer that question. For instance, a ray, in the sunlight here—it will smoke at a very much lower temperature, apparently, than it will out here on the table; because you can see the fumes there, just as you can see those motes in
352 that light there; so that it is a very difficult question to answer.

Q. 202. Well, approximately, if it were not in the sunlight, at what temperature, or to what temperature could cottonseed oil be raised before it smokes, before there is any appreciable smoke?

A. It seems to me it is about 280 degrees Fahrenheit, although I am not positive about that. It has been so long since I tried those experiments.

Q. 203. You have said you were graduated from Yale in 1887. Did you specialize in chemistry there?

A. Yes.

Q. 204. Prior to November 10, 1910, did you note any trouble, or any difficulties, due to the presence of nickel, or nickel soaps, in any of the edible products produced by, or for the Procter & Gamble Company, containing or consisting of oil previously treated by hydrogenization?

A. Is that word "Trouble?"

Q. 205. Yes.

A. No; we had no trouble.

Q. 06. You did not find any nickel soaps in the hydrogenated product?

A. No; not to my knowledge—in my opinion about it.

Q. 207. In hydrogenizing oils, in your opinion does it make any difference whether the hydrogenator is made of iron or of copper, so far as practical results are concerned?

A. Not having used any copper apparatus, I would be unable to answer that question.

Q. 208. Would it make any difference whether the hydrogenator were heated by gas flame instead of by electricity, so long as you succeeded in getting the desired temperature?

A. I don't think it would make any difference, if the agitation were sufficient to prevent local overheating.

(Signed) H. J. MORRISON.

Attest:

_____.

353 Thereupon an adjournment was taken, by consent of all counsel, to Thursady morning at ten o'clock, October 26, 1916, at which time the further taking of these depositions proceeded as follows:

Thursday Morning, October 26, 1916.

Pursuant to adjournment, all counsel were present as heretofore noted.

Thereupon, by agreement of counsel an adjournment was taken to the following morning, Friday, October 27, 1916, at 9:30 o'clock, at which time the further taking of these depositions was resumed as follows:

Friday Morning, October 27, 1916.

The further taking of these depositions was resumed pursuant to adjournment; counsel present as heretofore noted.

Thereupon, JAMES N. MCCAW, a witness produced in behalf of the defendant, having been first duly sworn, deposes and says as follows, in answer to interrogatories:

By Mr. May:

Q. 1. Will you please state your name, age, residence and occupation.

A. James N. McCaw; age, forty-seven; occupation, manufacturer; residence, Macon, Bibb County, Georgia.

Q. 2. Are you connected with the Procter & Gamble Company?

A. I am, sir.

354 Q. 3. What is your position with that company?

A. Well, I suppose you would say, Local Manager of the Macon Branch, sir. I have entire charge of their property down there; I have no official entitlement, though.

Q. 4. That local plant is engaged in the manufacture of lard substitute?

A. Of lard substitute, yes, sir.

Q. 5. Were you formerly connected with the McCaw Manufacturing Company prior to its acquisition by Procter & Gamble Company?

A. I was, sir.

Q. 6. What was your position in that company?

A. I was vice-president of the company, sir.

Q. 7. What were your duties?

A. I had charge of the financing and the credits, with the general accounting of that office—more of an office man.

Q. 8. How long had you had that position in the McCaw Manufacturing Company?

A. Well, ever since it was organized I was an officer; originally I was secretary and treasurer. The McCaw Manufacturing Company was formerly the Georgia Mills & Elevator Company—a change of name, but no change of work.

Q. 9. What relation are you to Mr. W. E. McCaw?

A. A brother, sir.

Q. 10. It is of record that the McCaw Manufacturing Company, prior to its acquisition by the Procter & Gamble Company, and prior to January, 1908, was in the business, among other things of manufacturing and selling lard substitutes under the names of "Flake White," "Invincible" and "Plantene." Were you then acquainted with the ingredients of these lard substitutes?

A. Generally speaking, yes.

Q. 11. And where—Of what was Flake White compounded?

A. Of cottonseed oil and oleo stearin.

355 Q. 12. How about Invincible and Plantene?

A. They were the same goods, sir, under different brands.

Q. 13. The same goods?

A. The Invincible and the Flake White are the same goods; the Plantene is made out of yellow oil instead of white oil—bleached oil—a difference in the color.

Q. 14. Invincible and Flake White are made of Summer White oil and stearin?

A. Bleached—and stearin, yes, sir.

Q. 15. Were there returned to the McCaw Manufacturing Company from time to time, goods which had been previously sold by the company and which were returned for some reason or another, such as being poor texture, or slightly rancid, or the like?

A. Oh, yes; off and on in the natural course of business we had, not numerous, but occasional lots, you might say, and in very few instances it was faulty manufacture which produced "Separation," as they called it; but the principal thing was where the customer had the goods too long and they became rancid. A small concern might buy, say, five or six hundred pounds a month, not sell it all, and have it on hand, accumulating in that way from month to month. Where it was a good customer, we would take it off his hands, and in other cases we would take it as soap grease; we were running a soap manufacturing also at that time; but as you will appreciate, any grease will become rancid in course of time—just to protect our goods—I make that statement.

Q. 16. Your goods where used in trade, were they goods where

they required material of a high grade, or was your trade mainly with the negro population?

A. Oh, no, sir; a very high class trade; we sold only the
356 best class of people—strictly an edible product.

Q. 17. What did you do with these goods that were returned from time to time, as you have said?

A. We would melt them, making a liquid formation, mix it with a low grade of tallow and put it in our low grade of soap. At that time, or at that period of time, we were making two grades of soap, what we called a "Hard soap." and a "Soft soap." The soft soap was a low grade of tallow and these rancid greases.

Q. 18. Sometimes you sold goods which were returned to you?

A. No, sir; I have no recollection of that; I don't think the records will show that. There was comparatively little of it and we used it in the manufacture of soap, sir.

Q. 19. Your brother, Mr. W. E. McCaw, has said several times that such goods were sometimes sold to the highest bidders; do you know anything about that?

A. Well, I think Mr. McCaw's intentions are right, sir, but he has got it just reversed. Instead of selling to Birmingham, upon one or more occasions—not lately, but perhaps two or three times, we have bought small lots, five, ten or twenty thousand pounds of low grade tallow, but we have never sold any of those returned goods to anybody.

Q. 20. You have never sold that in bulk?

A. No, sir.

Q. 21. To be used in the retail trade among the negroes?

A. No, sir; any goods that were not passed on by the Meat Inspector—I mean the Government Inspector—as an edible product, were condemned and we would make soap out it.

Q. 22. Do you recall, somewhere in 1908, a shipment of hard material that was received by your brother from Procter &
357 Gamble Company?

A. I can't say positively, now, sir, from the company—I think I understood from Mr. Procter, but I suppose it was probably the same thing; I know he and Mr. Procter were friends; if he had any from the company, I don't know—I haven't ever any knowledge of the company; but he got some samples, I don't know how many, probably two or three in number.

Q. 23. From Mr. Procter?

A. I understood they came from Mr. Procter, sir.

Q. 24. Did you see that hard material?

A. No, sir; not the actual material; I just saw the small box it came in.

Q. 25. Did you see your brother compounding that material?

A. No, sir; I had very little—I had no business there at the factory, practically, only occasionally I would go there and ask some questions about a shipment. I had nothing to do with the manufacturing end of it at all, or with the factory.

Q. 26. Your brother testified that he compounded that hard material which he received from Mr. Procter, with some cottonseed oil and ran it through the regular apparatus and made up several batches

of compound. Did you see that being done, or did you ever see any of the batches after they were completed?

A. No, sir; I have heard him speak of doing it and I have seen samples of what I would call the finished product, the lard substitute, as I would call it.

Q. 27. You have seen samples of that?

A. I have seen one or two samples of that, exactly how many, I can't testify to—not a great many though—I don't know how many.

Q. 28. It is a record that this material was sent down by
358 Colonel Procter to your brother, Mr. W. E. McCaw, sometime in May, 1908?

A. It was about that time—I think it was in April, but we will say May—it was in the spring of 1908, sir.

Q. 29. And it was at that time you saw these samples?

A. I saw the finished product—what I called the finished product. I did not see the original samples, sir.

Q. 30. I mean the finished product?

A. Yes; I saw the finished product.

Q. 31. Did you take any of it home with you?

A. No, sir.

Q. 32. Do you know what was done with it?

A. To the best of my knowledge and belief, sir, it was condemned, as we express it, condemned as not fit, not a merchantable product, and it was put in the rancid pile, or in the old grease pile and went into soap.

Q. 33. How long was it held before it was put into the rancid pile?

A. Oh, I can't state; it would depend—sometimes they would clean all their old refuse stuff out every few days; it was just a question of accumulation and when we needed it.

Q. 34. So that you would not personally know how long?

A. No, sir; that was a factory proposition and I wasn't acquainted with those details. I had nothing to do with the manufacturing end.

Q. 35. Do you recall another shipment of that hard material in August of 1908?

A. I don't remember the date, but a little later, probably two or three months later, that material was shipped in, probably in ton lots, one, two or probably three thousand pounds each—a large quantity, any way.

Q. 36. Did you see any of that hardened material when it came?

A. No, sir. I had no occasion to examine it, and I did not.

359 Q. 37. Did you see any of the finished product, after it was made up?

A. Samples of it, yes.

Q. 38. How large were the samples?

A. Oh, I suppose somewhere around two or three pounds, two or three-pound samples in an empty tin can; I just saw it casually, and when Mr. McCaw came around at that time, I asked him what it was, and he told me.

Q. 39. What did he tell you?

A. He said, "That is some of the experiment—some experiments

I am making on hardened stuff, to see if we can't get rid of the oleo." I says, "How is it"? I says, "It doesn't look good to me yet." It didn't look good to the eye. There was no unpleasant odor, or anything like that, but it just didn't look very good—just in the general consistency, I suppose you would describe it.

Q. 40. Yes.

A. But it didn't look very good—didn't compare favorably, I thought, with the product we were producing and selling at that time.

Q. 41. Was it harder or softer?

A. My recollection is, it was softer; I don't know exactly how you would express it, but the color and general consistency looked something like vaseline to me. Of course, I am trying to go back now about eight years, you understand, and it may be a little inaccurate; but I am making statements, as I am under oath, as truthfully as I can, sir.

Q. 42. Did you have the opinion that that vaseline-like appearance of the product was due to insufficient aeration?

A. You have asked me something now, sir, that I don't know; I can't tread on that ground; I cannot answer you. My duties there were in the office, principally, handling the bank accounts and the credits, the accounting and the bookkeeping and the general supervision of the office, which gave me practically no knowledge
260 of the factory. I have had very little factory experience until about five or six years ago, when the Procter & Gamble Company very kindly gave me the position I have with them now.

Q. 43. About how much of that compound was produced in August, 1908?

A. Well, in those days, sir, as I remember, we used to handle about four to five thousand tierces a month; counting the tierces at about three hundred and forty pounds each, would be about a million and a half pounds a month.

Q. 44. What I meant, was, how much of that particular compound, made of the hardened material of cottonseed oil was produced in August, 1908?

A. I do not think any, sir. I think we were using then oleo; they may have been testing it out, but as my recollection goes, it was cottonseed oil and oleo stearin and I know they gradually worked in this hardened oil, as my impression of it is, sir; now, the exact dates, or what percentage they were using, I cannot say; but I know they gradually weeded out the oleo stearin.

Q. 45. They did not begin, however, to produce the compound commercially with the hardened oil, and oleo stearin and cottonseed oil, until sometime probably in March, 1909?

A. Well, it was very shortly after the Procter & Gamble Company took us over. They bought us out in January, and formally took charge in February; it was two or three months later, probably thirty days later, or very shortly after that. We have never made any of this cottonseed oil stearin in Macon, that I know of.

Q. 46. I am not referring in my questions now to what was produced after the Procter & Gamble Company took over the McCaw

Manufacturing Company; but I wish to inquire specifically
361 about the material that was made up in August, 1908, from the hard matter which was sent down by Colonel Procter, or the Procter & Gamble Company, to your brother, W. E. McCaw. How much lard substitute was made up by your brother, using that particular hard matter which was sent by Colonel Procter in the summer of 1908?

A. As far as my knowledge goes, sir, and I think it is pretty accurate, there was none of this "5-X," I mean stearin, produced from cottonseed oil, used, until after the Procter & Gamble Company took charge of the McCaw Manufacturing Company and shipped it to us from Ivorydale, in carload lots; and I think that was in either March or April, 1909.

Q. 47. So that according to your recollection after the first few batches were made up in May, of 1908, your brother did not produce any further batches using hardened cottonseed oil until March or April of 1909?

A. I would say about a year later, sir.

Q. 48. So that so far as the manufacture of any material in August or September, 1908, you have no recollection?

A. No; I don't think at that time they had produced what you might term a satisfactory hardened oil, or satisfactory cottonseed oil stearin made from cottonseed oil, as we spoke of it commercially there in the office at Macon. I don't know how they treated it up here, or how they termed it. We call it "3–X"—the shortest is "3–X"—that is just a private designation.

Q. 49. Then you don't know what became of the compound which your brother made up in August of 1908, using the hydrogenized oil which was sent him at that time?

A. Well, to my knowledge and recollection, as I stated before,
362 there was such a limited quantity of that sent there—I don't suppose I would there was over three thousand pounds prior to the carload lot—that I don't believe there was any goods left that the McCaw Manufacturing Company made of the hardened oil.

Q. 50. You mean you don't remember of any being put upon the market?

A. No, sir; I don't believe there was. I have no record of it.

Q. 51. As a lard substitute?

A. No, sir; I have no record of it, of any—not a thing.

Q. 52. Did you personally make any cooking or other experiments with any of the batches which your brother made up, using the hydrogenized oil, prior to 1909?

A. No, sir; I never made any of those tests in my life, at any period.

Q. 53. Did you taste any of those batches, or samples of the finished product which your brother made up, using the hydrogenized oil?

A. No sir.

Q. 54. You did not notice any unpleasant odor from them?

A. No, sir.

Q 55. You cannot say whether or not it had an unpleasant taste?
A. I cannot say, sir. In fact I might as well say that I literally know nothing about it at all sir.

It is stipulated and agreed between counsel that the reading by the witness of the deposition, when reduced to writing, and the signature of the witness to the deposition, may be waived.

Counsel for both parties desire to have it stated upon the record that for the purpose of saving a trip by counsel to the home of Mr. James N. McCaw, Macon, Georgia, that Mr. McCaw came to Cincinnati to give his deposition.

In witness whereof, I have hereunto set my hand and affixed my seal as of Friday, October 27, 1916.

B. E. DILLEY,
Special Examiner.

363 *Clerk's Certificate.*

In the District Court of the United States, Southern District of New York.

In Equity. No. 13—100. Burchenal Patent No. 1,135,351.

PROCTER & GAMBLE COMPANY, Plaintiff,

vs.

BERLIN MILLS COMPANY, Defendant.

I, Boyd E. Dilley, Clerk of United States District Court for the Southern District of Ohio, duly commissioned and authorized to take and certify depositions, acting as Special Examiner, do hereby certify that I was attended at my office, No. 317 Federal Building, in Cincinnati, Ohio, by Alfred M. Allen, Esq., counsel for the plaintiff, and by Marcus B. May, Esq., and Frank E. Barrows, Esq., counsel for the defendant, by agreement of counsel, on Friday, October, 27, 1916;

That thereupon said counsel entered into a stipulation in the terms as hereinbefore stated in respect of said depositions hereinbefore appearing;

I further certify that the deponents, William Cooper Procter, John J. Burchenal, Wallace Eugene McCaw, Albert Edward Anderson and Harley E. Morrison all reside in Ohio; that the deponent James N. McCaw resides in Georgia, all more than one hundred miles from the place wherein this civil cause is appointed to be tried; that I am neither of counsel nor attorney to either of
364 the parties, nor connected by blood or marriage with either of the parties, or interested directly or indirectly in the matter in controversy, or in the event or result of this cause; that said stipulation and said copy of said depositions have remained exclusively in my possession until the time of their transmission to the Clerk of the United States District Court for the Southern District

of New York; and that it being impracticable for me to deliver the same into the Court in which said cause is appointed to be tried, I have sealed the same, have directed in my own hand and have speedily and safely transmitted the same to said Court, there to remain under my seal until opened.

Witness my hand and seal as Special Examiner, at Cincinnati, Ohio, this 9th day of November, 1916.

B. E. DILLEY.

365-368 *Stipulation.*

In the District Court of the United States, Southern District of New York.

In Equity. No. 13—100. On Burchenal Patent No. 1,135,351.

PROCTER & GAMBLE COMPANY, Paintiff,

vs.

BERLIN MILLS COMPANY, Defendant.

CHICAGO, 25th October, 1916.

10:00 o'clock a. m.

Depositions Taken de bene bese, on Behalf of the Defendant, Pursuant, to Sections 863 et seq., U. S. Revised Statutes, by Agreement of Counsel, before Alice M. Rankin, Notary Public, Acting as Special Examiner, beginning at 10:00 o'clock Wednesday Morning, 25th October, 1916, at Room 1608 First National Bank Building, Chicago, Illinois.

Present:

Alfred M. Allen, Esquire, and J. B. Macauley, Esquire, representing the plaintiff.

Marcus B. May, Esquire, and Frank E. Barrows, Esquire, representing the defendant.

Whereupon the following proceedings were had:

Stipulation.

It is stipulated and agreed that an order of Court may be entered at any time nunc pro tunc, appointing Alice M. Rankin special examiner in this cause.

369 CLARENCE VON PHUL, a witness produced on behalf of the defendant, having been first duly sworn, deposes and says as follows, in answer to oral interrogatories:

Direct examination.

By Mr. May:

Q. 1. Mr. von Phul, will you please state your name, age, residence and occupation?

A. Clarence von Phul; age, sixty-two, January 24th next; my residence is 7157 Yale Avenue, Chicago. I am a railroad clerk.

Q. 2. What has been your education, Mr. von Phul?

A. Well, my primary education was at the Sixteenth District School in Mt. Auburn, Cincinnati, Ohio. I went through the district and intermediate departments of that school; then attended a private school by John Marvin, now Dr. John Marvin, of Pleasant Ridge, Ohio; William H. Taft, Howard Hollister and myself taking this extra course for an examination to pass for the classical course in the Woodward High School at that time, I believe it is called the Woodward College now, at Cincinnati. I was in Professor Peabody's room, who still lives in Wyoming, Ohio, who taught Latin and Greek; that was in the year of 1872. My father sold his residence in Mount Auburn and bought a home at 356 West Seventh Street, Cincinnati, Ohio, and I was transferred from the Woodward High School to Hughes High School; that is now consolidated with the Cincinnati University, I believe; they are in the same neighborhood, anyhow. I was then in Dr. Thorton's class; he was then the principal of the Hughes High School; and I was in Jacob Bromwell's room. After one year I went back to Dr. Marvin, who
370 was then studying medicine, and took a special course and passed an examination for the Washington University and had one year's course there. I took a trip out to California with my mother and upon my return I matriculated in the Miami Medical College, at Twelfth Street, Cincinnati, Ohio. During the time I lived in Mount Auburn, I was a draughtsman of some considerable note and went to Forberger's School; it was in the basement of the church at the corner of Elm and Twelfth Streets, Cincinnati, Ohio; and after attending that primary school I went to the Ohio Mechanics' Institute, corner of Sixth and Vine Streets, taking an architectural course and obtaining the bronze medal. After giving up medicine I went with Walters & Humphrey, architects, in the Reed Building, Fourth Street, Cincinnati, Ohio. At the expiration of a year I went into partnership with Mr. Humphrey. We opened an office over Seasongood, Netter & Company's bank on Third Street, 74 West Third. I remained with Mr. Humphrey two years, when we dissolved partnership and I went as assistant superintendent in building the St. Francis de Salles Church, on Walnut Hill. Mr. Klein, one of the directors of the church, induced me to open an office for myself on the opposite corner from the church. I gave that up and left for Chicago in 1879. There was nothing doing here in the architectural profession and I went to

Whitehall, Michigan, and obtained a position with the county surveyor of Muskegon County, Muskegon, Michigan, laying out county roads. I went from there to the Charles Cook Lumber Company, nine miles back of Whitehall, laying out tramways. After cleaning up that section, I went over to Allegan, Michigan, and from there to Muskegon and back to Chicago and obtained a posi-
371 tion with the P. F. W. & C. Railroad as brakeman. I ran on the road a short time and returned to Cincinnati where I obtained a position as paym-ster of the Cincinnati Cooperage Company.

Q. 3. I think that gives substantially what I want in the line of your education, and now I will ask you whether or not you ever knew a man by the name of Edwin Cuno Kayser?

A. Yes. I met Mr. Kayser at my wife's residence, 3553 Bogart Avenue, Avondale, Cincinnati, Ohio.

Q. 4. How was it that you happened to meet Mr. Kayser?

A. Well, just in a casual way, incident that he was having a room at my wife's residence.

Q. 5. Where had you been previous to meeting Mr. Kayser?

A. In the employ of the Rock Island Railroad, Chicago, Illinois.

Q. 6. And that was in what year?

A. That was in 1907.

Q. 7. How did you happen to go to Cincinnati?

A. My wife resided there and I was in Chicago; I went there on a visit.

Q. 8. And that was when?

A. In November, 1907.

Q. 9. And it was at that time that you met Mr. Kayser?

A. That I met Mr. Kayser.

Q. 10. And as you say, Mr. Kayser was then living at your house on Bogart Avenue in Cincinnati?

A. He was there when I got home.

Q. 11. Were you there for some time after that?

A. I remained there until the following spring, about March.

Q. 12. And during that time how often would you meet Mr. Kayser? A. In the evenings, very nearly every evening that he was home.

Q. 13. Did you know where Mr. Kayser was employed at that time?

A. Procter & Gamble Company, at Cincinnati.

372 Q. 14. What work was he doing, if you know?

A. He was getting up a patent for a food product, he so informed me.

Q. 15. And how early was it that you learned that?

A. Well, that was soon after I got home. I don't know how soon after; we got pretty well acquainted. I used to go to his room a good deal and smoke in a social way.

Q. 16. Did he tell you how he was going to make this food product?

A. Well, not the chemical process, no. I probably would not have understood it, because I am not a chemist.

Q. 17. Just what did he tell you about this matter?

A. He said that he was producing a food product from cottonseed oil by a chemical action.

Q. 18. Did you ever see any of that product?

A. I saw one sample of it which he brought home.

Q. 19. Please tell the circumstances attending that.

A. Well, he brought home this sample and he turned it out, it looked like it had been moulded in a jelly glass; it was round on the end. He turned it out in his hand and showed it to me, and said it was a sample that he had produced in his laboratory, and he was very much elated over it.

Q. 20. When was that, if you remember?

A. That was about in January, 1908.

Q. 21. Did he tell you why he was elated?

A. Well, just merely, I presume, from the result that he had obtained, so he could show Procter & Gamble that he had actually made the product that he proposed to them that he could.

Q. 22. Was that the first product that you had seen?

A. The first and only one; I never saw any before or since.

Q. 23. What did it look like?

573 A. Well, it looked like tallow. In fact, I remarked at the time it didn't look like a food product; it looked like the tallow we used when I was a child for rubbing on our boots to keep the rain from going through; looked sort of a yellowish, not a perfect white color.

Q. 24. Do you know whether or not he had previously produced a like product at Procter & Gamble's?

Mr. Allen: The question is objected to in view of the witness having stated that this is the only time that he had ever seen a product of that kind, and also as leading.

Q. 25. What did he say about that product?

A. That it was for cooking purposes.

Q. 26. Do you know why he brought that home?

A. He never made a statement specifically as to that.

Q. 27. Did he say whether or not he had previously produced such a product at the Procter & Gamble Company?

A. No, I never heard of any production of a product until I saw the result.

Q. 28. Do you know whether or not that was the first product that he had produced for the Procter & Gamble Company?

A. Yes, he said that was the first product.

Q. 29. Did you do anything further with Mr. Kayser touching his business with Procter & Gamble Company, or touching the matters that he was working on?

A. Well, in making that drawing for him.

Q. 30. You made a drawing for Mr. Kayser?

A. Yes, sir.

Q. 31. When was that?

A. Why, he brought home, it was on a business card, a rough

sketch, a hand drawing, and asked me if I could set it up
374 on my drawing board for him; and I told him that I thought I could and so I got my board and T-square and instruments and set up the machine according to his instructions.

Q. 32. Why did he want you to make a drawing, if you know?

A. He wanted it for a patent attorney, he said, to get out his patent papers with Procter & Gamble.

Q. 33. What did the drawing that you made show, if you remember?

A. It showed a tank and a sectional drawing of the interior showing the shaft and the paddles. I remember distinctly in setting the paddles to the center he remarked in regard to the centrifugal force, it would not be practical, so I changed it.

Q. 34. What became of the drawing that you made?

A. I gave it to Mr. Kayser. It was not set up to any special scale. It was just merely for the purpose of telling the patent attorney what we wanted.

Q. 35. Who was the patent attorney?

A. Well, I recommended Mr. Parkinson, who was a friend of mine.

Q. 36. Do you know whether or not Mr. Kayser did get a patent on the apparatus you drew for him?

A. That was always my impression and I met Mr. Parkinson once afterwards. He didn't say very much about it, but I understood from the general conversation that Mr. Kayser had obtained a patent.

Q. 37. I show you a copy of a patent which has been introduced in evidence in this cause, and direct your attention to the drawings, and ask you if you know what those drawings are or show?

A. That's merely identical with the original sketch that was got up to take to Mr. Parkinson for him to make the patent drawings.

375 Mr. May: The witness is shown copy of Kayser's patent No. 1,004,035, sheet 1.

Q. 38. When did you say you left Cincinnati to return to Chicago?

A. In March, 1908.

Q. 39. So that you made this drawing for Mr. Kayser before you left Cincinnati?

A. I did, yes, sir.

Q. 40. Did you understand what the machine shown in the drawing was for?

A. Yes, it was to produce a product from the oil into food stuff by a chemical process.

Q. 41. How well acquainted did you get with Mr. Kayser?

A. Well, we got to be pretty well acquainted. We took walks together on Sundays, long walks, he was very fond of walking.

Q. 42. Did Mr. Kayser make many friends?

A. No; as far as I know, I was the only one I ever heard of him going to see, and his patent attorney.

Q. 43. Was he a man that told his business generally?

A. No, sir, he was not; a very close man.

Mr. May: I think that is all.

Cross-examination.

By Mr. Allen:

X Q. 44. Mr. von Phul, in giving the history of your various employments, you came down to the time when you were paymaster for the Cincinnati Cooperage Company.

A. Yes.

X Q. 45. When was that?

A. That was in 1880.

X Q. 46. What did you do next?

A. I went into the local office known then as the "B. Line" or "Nipp & O." It is now part of the Big Four System, running from Cincinnati to Cleveland.

X Q. 47. What was your employment there and how
376 long did you remain there?

A. I was local bill clerk; I remained there probably a year.

X Q. 48. Then where did you go?

A. I went to Baltimore, Maryland, with Bird & Weams as—well, I might have been called a general clerk there. I was shipping clerk and selling in the house and doing most everything.

X Q. 49. What was the business of Bird & Weams?

A. Importers of foreign fruits and fancy groceries.

X Q. 50. How long were you there and what did you do next?

A. I was there three years and the firm failed. I went back to Cincinnati and went into the Car Accountant's department of the B. & O. S. W. Railroad.

X Q. 51. When was that?

A. That was in 1884 or 1885, somewhere around there. I was then sent for by the freight and ticket accountant, A. Wupper, of the Big Four Railroad, and went into the auditing department, checking the rates to and from the road. I was promoted after being there about a year as general utility man; that is, when any clerk was absent, I took his desk. I received an offer from the C. & N. O. T. P. Railroad, at a better salary and went there for a short time only.

X Q. 52. How long were you at the C. T.?

A. Not more than six months. I then went from there over to the C. H. & D. Railroad, with Mr. A. H. McCloud, general freight agent in the claim department; that was in 1889. I obtained passes from that system, intending to go to Spokane Falls, Washington. I went out to Seattle and came back to Cincinnati, bought a carload of buggies and returned to Spokane. In the interval of my leaving Seattle and getting back to Cincinnati, Spokane burned down and when I got back there I soon sold out my buggies. I remained
377 there probably a year and returned to Cincinnati and met Mr. Buchanan, who was then assistant general freight agent of the Big Four Railroad, who obtained me a position in C. V. Lewis' office, who was at that time freight claim agent of the Big

Four System. I left that road to go with the Continental Line as chief clerk.

X Q. 53. When was that?

A. 1890. I remained with Mr. McLaughlin until 1892. From 1892 until 1896, I was unemployed and lived in Wyoming. I then returned to the B. & O. S. W.

By Mr. Macauley:

Q. Is that Wyoming, Ohio?

A. Wyoming, Ohio; lived there sixteen years.

X Q. 54. A suburb of Cincinanti?

A. Yes, sir. I went back to Mr. S. T. McLaughlin, who had been transferred from the Continental as general manager, to the B. — O. S. W., as general freight agent, as chief clerk of the claim department, and remained with him until they transferred the office to Baltimore, Maryland. I then organized the Cincinnati Shippers' Freight Claim Agency.

X Q. 55. When was that?

A. That was in 1896, I think, as near as I can remember, having desk room in James Graff's office in the Johnson Building, Cincinnati, Ohio. I was transferred from James Graff's office to Foreacre, Olcott, Granger and Prior's office, in the Carew Building.

X Q. 56. What business were they in, Foreacre, Olcott, Granger & Prior?

A. They were attorneys.

X Q. 57. How long were you there, and what did you do next?

A. I was there but a very short time, when I was transferred to the Neave Building, corner of Fourth and Race Streets, Cin-
378 cinnati, Ohio. The business not paying, I gave it up in a short time after going into the Neave Building. I was employed with the Pere Marquette Railroad Company, which had just then removed its offices from Detroit to Cincinnati.

X Q. 58. When was that?

A. I think that was in about 1902, somewhere around there; I am not positive on dates because I had no occasion to remember it.

X Q. 59. We just want your best recollection.

A. I was made chief clerk over the Pere Marquette and C. H. & D. Railroad in their claim department and remained there until July, 1907. The last day of July, 1907, I came to Chicago and on August first, which was Saturday, I was employed by the Chicago, Rock Island and Pacific Railroad of Chicago in their claim department; that is where I was when I went to Cincinnati for the visit.

X Q. 60. When was it you returned to Cincinnati?

A. In November, 1907.

X Q. 61. Early part of November or the last of November?

A. Well, it was before Thanksgiving, because I was home Thanksgiving Day.

X Q. 62. Just before Thanksgiving?

A. Somewhere along there.

X Q. 63. And Mr. Kayser was boarding with your wife at that time?

A. No, he was not boarding; he had a room there.

X Q. 64. Just had a room?

A. Yes, sir.

X Q. 65. When were you married, Mr. von Phul?

A. Married June 1, 1880, just when I went into the Cincinnati Cooperage Company.

X Q. 66. Did your wife move with you to the various cities and places away from Cincinnati where you had employment?

A. Yes, sir.

X Q. 67. How long had your wife been living at this
379 place in Avondale where Mr. Kayser had his room?

A. When I went to Chicago, on the last day of July, 1907, she had a cottage at Chautauqua Heights in Loveland, Ohio, and while I was in Chicago she moved out to this Bogart place.

X Q. 68. Have you any family, any children?

A. Yes, five girls and one boy.

X Q. 69. Were they living there?

A. Well, all but one daughter; I think she was out in California.

X Q. 70. Are your girls married?

A. Yes, the girls—three of the girls are married, and one boy, now; but they were not at that time.

X Q. 71. Well, I mean in 1907?

A. No, I don't think any of them was married at that time.

X Q. 72. And they were living at home?

A. Yes, sir

X Q. 73. About how old were they at that time, in 1907—I mean, were they small children?

A. Rose and Henry were the smallest; the balance of the girls were grown girls.

X Q. 74. And Henry was how old, or about how old?

A. Well, Henry was next to the youngest; he was probably a boy twelve or thirteen years old.

X Q. 75. And the next child was how old?

A. About eight or nine.

X Q. 76. Or was in 1907?

A. Yes.

X Q. 77. As far as you remember, they were all there at this house in Avondale, living there, except one of the daughters who was married?

A. No, I don't believe she was married at that time.

X Q. 78. Were your grown daughters all at home?

A. Yes; they were all at home; this was a very large house, you know.

X Q. 79. To whom were they married, what are their names?

A. Clara is the oldest, and she married Mr. Kirk of Los Angeles.

380 X Q. 80. Living out there now?

A. Yes, sir.

X Q. 81. The other married daughters?

A. Mrs. Henry Steiner, Wyoming, Ohio; Mrs. Jesse H. Sanford, Pittsburgh, Pennsylvania.

X Q. 82. What is Mr. Sanford's name, Jesse?

A. Jesse.

X Q. 83. And she lives there with her husband in Pittsburgh?

A. Yes, sir; he is vice-president and general manager of the Carnegie Coal Company.

X Q. 84. And Mr. Henry Steiner, what business is he in?

A. He is manager of the Johns-Manville Company on Main Street, Cincinnati, Ohio.

X Q. 85. And Mrs. Kirk, what is her husband's name and his business?

A. Harvey.

X Q. 86. Harvey Kirk?

A. Yes, sir.

X Q. 87. And what is his business?

A. Well, he has these large automobile trucks and does a contracting business.

X Q. 88. You say you spent a year at Hughes High School in Cincinnati?

A. Yes, sir.

X Q. 89. Which year was that, freshman, sophomore, junior or senior?

A. That was the classical course: we took the four years in three; it was a new course, just instituted at that time that I went in, in 1872.

X Q. 90. And who was your teacher in that classical course, in Latin or Greek, or whatever you took?

A. Mr. Thorton, T-h-o-r-t-o-n, he taught Latin and Greek; and Jacob Bromwell, geometry, spherical trigonometry and calculus.

X Q. 91. Are you sure it was Mr. Thorton at the Hughes High School?

A. Yes, sir: because he died afterwards, a short time afterwards.

X Q. 92. When was it, as far as you remember, that you said Mr. Kayser showed you a sample of this hard material that he had made?

A. It was in January, 1908.

381 X Q. 93. January, 1908?

A. Yes, sir.

X Q. 94. This looked as if it had been moulded in a glass and dumped out?

A. Yes, in a jelly-glass form.

X Q. 95. Had a round bottom to it?

A. Round bottom and flat top.

X Q. 96. Looked as if it might be a fat candle, didn't it—something of that kind?

A. Well, I never made that comparison in my own mind; just merely looked like tallow.

X Q. 97. Well, I know: but make the comparison now in your own mind. Didn't it look like a fat candle with a rounded end?

A. No, I could hardly stretch my imagination to a candle being of that shape.

X Q. 98. Well, not of that shape, but of that character?

A. You mean of the material or the——

X Q. 99. I mean whether it didn't look like a broken off piece of a candle material?

A. No, sir; it just looked like a sample of tallow that had been poured into a glass and formed a mould the same shape of the glass.

X Q. 100. It was hard, however?

A. Yes, it was hard.

X Q. 101. Did you see Mr. Kayser after you left there in March, 1908?

A. Yes, I met him in Wyoming.

X Q. 102. When did you meet him in Wyoming?

A. After he had moved. His wife came here from Europe and they took a house out there, and my wife and I used to go over and visit them together.

X Q. 103. You were then living in Wyoming?

A. My wife was living in Wyoming; I was still employed in Chicago in the railroad business and wanted to find out whether we cared to make the move; we didn't want to make it in too big a hurry.

382 X Q. 104. Well, when did your wife move to Wyoming?

A. Well, that was when I came back to Chicago.

X Q. 105. In March, 1908?

A. It must have been around that, nearly.

X Q. 106. Well, how often did you see Mr. Kayser in Wyoming, how often were you back to your home in Wyoming?

A. Well, I only made one more visit there before they came up here to Chicago to live permanently; I moved them up here.

X Q. 107. When did you move up to Chicago?

A. In March, 1909, I think, was when they came up there—they must have come up in February; they were here in March.

X Q. 108. You didn't see Mr. Kayser after that?

A. No, sir.

X Q. 109. You don't know how long he remained in Cincinnati?

A. No, sir.

X Q. 110. Did you know at this time, in the early part of 1908, what the business of the Procter & Gamble Company was?

A. They were in the soap business.

X Q. 111. Any other business?

A. Nothing that I had ever heard of.

X Q. 112. They were not engaged in food product business?

A. No, sir; not that I ever heard of; I remember the firm ever since I can remember anything in Cincinnati.

X Q. 113. When Mr. Kayser showed you this sample in the early part of 1908, I wish you would tell us everything that you can remember that was said at the time and what happened. What did Mr. Kayser say, how did he produce the sample? Give us a picture of what happened.

A. Well, as near as I can recollect, I went into his room. He

383 was standing, and took this sample out of a piece of paper and placed it on his hand that way (indicating), and he smiled and told me that that was——

X Q. 114. What did he say?

A. Well, as near as I can recollect, he made the statement that that was the first product that he had made in his laboratory.

X Q. 115. Out there in his experiments with Procter & Gamble Company?

A. Yes, sir; he seemed to be very much elated over it.

X Q. 116. Is that all that he said, as far as you can remember?

A. Yes. Of course, he didn't say anything further, because he knew that I didn't understand the chemical process and it would not be necessary.

X Q. 117. And you just looked at it?

A. Looked at it and remarked it looked like tallow we used for putting on our shoes as children.

X Q. 118. That is all that happened at that time?

A. That is all that happened at that time.

X Q. 119. And that is the only time this came up between you?

A. Yes, sir.

X Q. 120. Were you subpœnaed to testify in this case, Mr. von Phul?

A. Yes, sir (handing paper to counsel for plaintiff).

X Q. 121. When did you first hear of this case or litigation in regard to this patent matter?

A. I was trying to recall an article that I first read in the paper, where Procter & Gamble had entered suit, I believe, in the United States Court.

X Q. 122. That was your first information?

A. That was the first information that I had.

X Q. 123. And after that did you hear anything more?

A. Yes, sir, I was called up on the telephone, and wanted to know if I was Mr. von Phul that lived at Bogart Avenue in Avon-
384 dale, and I had forgotten the address at that time and I said no, and my wife said, "Yes, you did," and I said, "Oh, yes." I remember then that she did, and they said someone wanted to speak to me in regard to that, and it turned out to be our friend here, this gentleman (indicating one of counsel for defendant). That is the first I knew anything of the suit.

X Q. 124. By "our friend here" you mean Mr. Barrows?

A. Mr. Barrows, yes, sir.

X Q. 125. How long ago was that?

A. That is about three or four months ago.

X Q. 126. Was the telephone a long distance 'phone from some other city, or was it from Chicago?

A. It was from Chicago.

X Q. 127. Did you see Mr. Barrows then?

A. Saw him that evening, yes sir.

X Q. 128. And talked the matter over with him?

A. Yes, sir.

X Q. 129. Freely?

A. Yes. Just as I am now.

X Q. 130. Perfectly willing to tell him all that you remembered and knew about it?

A. Yes, sir.

X Q. 131. You would have been perfectly willing to come here and testify to what you know without a subpœna?

A. Yes, sir.

X Q. 132. Have you talked with Mr. Barrows since that visit of some months ago, until the present day?

A. Yes, I met him and he introduced me to Mr. May and we talked the matter over.

X Q. 133. When was that, how long ago was that?

A. Probably about a week or ten days ago.

X Q. 134. And did you give them any written statement about this?

A. Yes, I made an affidavit.

X Q. 135. You made an affidavit?

A. Yes, sir.

X Q. 136. When was it you made the affidavit, three or four months ago?

A. Yes, on the first visit.

285 X Q. 137. At the time of this first visit of Mr. Barrows to you, where was this, at your residence?

A. Yes, sir, 7157 Yale.

X Q. 138. Did you tell him you wanted pay for your trouble?

A. No, sir; no compensation mentioned whatever.

X Q. 129. And no compensation has been mentioned?

A. No, sir.

X Q. 140. They have not paid you anything?

A. Yes, they paid me a hundred dollars the first visit, or the last—on the last. When that affidavit was made no compensation or anything said about money before.

X Q. 141. And after you had talked and after you had given the affidavit they gave you a hundred dollars?

A. After the affidavit was signed he called the young man in and went out and told me to wait a little while and came in and handed me ten new ten-dollar bills and I have the ticket yet here, I kept it right here. Yes, I was very pleased to get it, although I didn't anticipate it.

X Q. 142. What is this you have handed me?

A. That is the wrapper on the ten ten-dollar gold notes that I received.

Mr. Allen: Counsel for plaintiff offers the wrapper referred to by the witness in evidence and asks to have the same marked "Plaintiff's Exhibit, Money Wrapper."

The exhibit was marked by the reporter "Plaintiff's Exhibit, Money Wrapper, October 25, 1916, A. M. R."

X Q. 143. At the time of this original visit of Mr. Barrows and the talk you had with him and the signing of the affidavit, not a word was said about pay of any kind?

A. No, I don't think money was ever mentioned that I can

286 recollect, excepting, well, there was a telephone message that came to my wife, long distance, from my daughter from Procter & Gamble, saying that if there was any money consideration

I had better get it first, but I didn't use that term, I didn't want to be in the category of being bought.

X Q. 144. Which daughter telephoned by long distance?

A. Mrs. Steiner, Mrs. Henry Steiner, of Wyoming, Ohio.

X Q. 145. This was before you were telephoned to in Chicago by Mr. Barrows?

A. No, it was after I was telephoned to.

X Q. 146. Did Mr. Barrows come out to your house on the same day that he telephoned to you?

A. That evening.

X Q. 147. That evening?

A. Yes, sir.

X Q. 148. Did he bring a notary with him?

A. No, sir, nothing at all; just simply a general conversation.

X Q. 149. Well, this affidavit that you signed was written up, I understood, out there at your house.

A. No, the affidavit was writ-en up and I went down to the Monadnock Building and signed it.

X Q. 150. In Chicago?

A. Chicago.

X Q. 151. When, the next day?

A. Yes, the next day.

X Q. 152. Do you remember what office it was in the Monadnock Building?

A. Well, I believe it was in some patent attorney's office; I don't remember the name, though.

X Q. 153. This affidavit that you signed, have you seen it since that time, this four months ago when you signed it?

A. Yes, I kept a copy of it.

Mr. Allen: I will ask counsel to produce the affidavit, so I may inspect it.

387 Mr. May: I expected to introduce the affidavit in evidence, but inasmuch as the matter has arisen I now therefore offer in evidence on behalf of the defendant the affidavit which was executed by Mr. von Phul, and ask the same be marked "Defendant's Exhibit, von Phul Affidavit."

The document was marked by the reporter "Defendant's Exhibit, von Phul Affidavit, October 25, 1916, A. M. R."

Mr. Allen: The introduction of the affidavit by counsel at this time is objected to as the witness is under cross examination, and counsel has merely asked for the affidavit for inspection.

X Q. 154. In this statement it says that early in November, 1907, you secured a leave of absence from the Rock Island Road and visited your wife and family in Cincinnati. I understood you to say that it was just prior to Thanksgiving Day that you went down?

A. Well, that is in November.

X Q. 155. One was early and the other is late, is it not?

A. Yes, but I was there before Thanksgiving. I was home Thanksgiving Day to dinner.

X Q. 156. And you were there several weeks before?

A. Yes, I was there; that is, I went down the early part of November.

X Q. 157. In the early part of November?

A. Yes.

X Q. 158. That is, several weeks before Thanksgiving Day?

A. Yes, sir.

X Q. 159. Are you sure of that?

A. Yes. That can be produced, the documentary evidence, if you wish, by the records of the Rock Island Road. They keep everything in detail there.

X Q. 160. You went direct to Cincinnati, did you?

A. I went direct to Cincinnati.

388 X Q. 161. And after you arrived there, Mr. Kayser was there with a room?

A. Yes, sir.

X Q. 162. I wish you would look up the records of the Rock Island Road, if you can, and find when it was you left here in November, 1907, to go to Cincinnati.

A. Well, the evidence there will show the time that I left the Rock Island Road and the time that I came back.

X Q. 163. Yes. Will you look those dates up and give them to us?

A. Yes, sir.

By Mr. May:

Q. You don't happen to have that date with you, Mr. von Phul?

A. No, I have not got that date with me. I can get it from Mr. Bunger, though, the general superintendent of loss and damage claims; that is his official title.

X Q. 164. This drawing that you made was not a Patent Office drawing was it? Was it on Patent Office drawing paper?

A. No, sir.

X Q. 165. It was merely sketches of the apparatus?

A. Mr. Kayser brought home a card, a business card, and on the back of that card he had roughly drawn, without scale, merely the idea of what he wanted produced in a better form.

X Q. 166. And you, on a piece of paper, made sketches in better form?

Mr. May: I suggest that you better let the witness complete the answer to his questions. He intended to complete the answer, before you interrupted.

Mr. Allen: I beg your pardon.

A. I got my drawing board and T-square and instruments
389 and laid out the drawing symmetrically, without any scale or proportions, and he used that to go to the patent attorney to discuss with him what he wanted.

X Q. 167. At least he said that was the use he was going to put it to?

A. Yes, that is what he said.

X Q. 168. This was on a piece of white paper? What kind of paper was this on?

A. Regular drawing paper that I had myself.

X Q. 169. Regular drawing paper?

A. Yes, sir. It was not laid off in blocks, or engineer's scale, or anything of that kind.

X Q. 170. Was this before or after he had shown you this sample, that you made this drawing?

A. It was after.

X Q. 171. You made the drawing after he showed you the sample?

A. Yes, sir.

X Q. 172. And at the time you made this drawing for Mr. Kayser he asked you who was a good patent attorney to go to?

A. Yes, sir.

X Q. 173. And you recommended Mr. George B. Parkinson?

A. I did.

X Q. 174. And that is the reason he went to Mr. Parkinson, as far as you know?

A. Yes, sir.

X Q. 175. About how long after Mr. Kayser showed you the sample was it that he had you make this drawing of apparatus?

A. There was several weeks intervening.

X Q. 176. Your recollection would be it, would be about the first of March?

A. These drawings were made?

X Q. 177. Yes.

A. No; the drawings were made somewhere in January.

X Q. 178. Then it was about the latter part of January, as far as your recollection goes?

A. Yes.

X Q. 179. Was your wife present when Mr. Kayser showed you this sample?

A. No, sir she saw it afterwards.

390 X Q. 180. Was your wife present at the interview with Mr. Barrows three or four months ago?

A. When he came to the house, yes, sir.

X Q. 181. Did you have an interview with him before he came to the house?

A. No, sir; never saw him before the interview.

X Q. 182. Was anybody else present besides Mrs. von Phul?

A. No, sir; only my wife, and myself and Mr. Barrows.

X Q. 183. Was anybody else present at the time Mr. Kayser showed you this sample?

A. No, sir.

Mr. Allen: Counsel for Procter & Gamble Company wishes to further object to the introduction by the defendant of the affidavit which has been marked "Defendant's Exhibit, von Phul affidavit, October 25, 1916," as not the best evidence, and not evidence at all to be offered on behalf of the defendant.

Redirect examination.

By Mr. May:

R. D. Q. 184. Mr. von Phul, do you recall how many evenings it was that Mr. Barrows called on you at your home in Chicago prior to your signing of the affidavit?

A. I think he called twice.

R. D. Q. 185. And spent two evenings with you, talking these matters over.

A. Yes, sir.

R. D. Q. 186. And after the affidavit had been prepared, did it correctly set forth what you had told Mr. Barrows?

Mr. Allen: The question is objected to as incompetent, irrelevant and immaterial, and not proper re-direct examination.

A. It did.

391 R. D. Q. 187. Did Mr. Kayser talk over any of his business matters with your children, so far as you know?

A. No, sir; never talked with anybody but me.

R. D. Q. 188. Did Mr. Kayser speak any other language than English?

A. He spoke the German language.

R. D. Q. 189. How about your wife?

A. My wife speaks German.

R. D. Q. 190. Now, you said in your direct examination something about this material which Mr. Kayser showed you being used for a food product. Just when did that arise?

Mr. Allen: The question is objected to as leading and improper re-direct examination.

A. When he showed me the result of his experiment.

R. D. Q. 191. Just what did he say about it?

Mr. Allen: Same objection.

A. Well, I can't recall the exact words, but he just made the statement that it was a food product, for food purposes.

R. D. Q. 192. And at that time Procter & Gamble Company were in the soap business?

A. Yes sir; so far as I know they always have been.

R. D. Q. 193. Did that make any impression on your mind, that particular incident?

Mr. Allen: The question is objected to as leading and irrelevant, immaterial and incompetent, and not proper re-direct examination.

392 A. When he spoke of it as a food product I laughed, because it resembled a tallow, which I remarked is what we used when I was a school boy, for putting on our shoes to keep snow water out.

R. D. Q. 194. And when was that?

A. That was when he brought the sample home in January.

R. D. Q. 195. At the time when he held it in his hand and showed it to you?

A. Yes, sir.

R. D. Q. 196. Did he say whether it was to be used for any other purpose?

A. No, sir; he did not.

R. D. Q. 197. Did you think it looked like a food product?

Mr. Allen: The question is objected to as incompetent, irrelevant and immaterial, and not proper re-direct examination, and as leading.

A. I did not.

R. D. Q. 198. Now, when you left Chicago to go to Cincinnati, in November, 1907, did you go directly from Chicago to Cincinnati?

A. Yes, sir; my object was to visit my family.

R. D. Q. 199. How long did that sample which Mr. Kayser brought out home remain around the house?

Mr. Allen: Objected to as leading, and improper re-direct examination.

Mr. May: The question is withdrawn.

R. D. Q. 200. Did you see that sample again after Mr. Kayser first showed it to you?

Mr. Allen: Objected to as improper re-direct examination.

A. Yes. I think he placed it in his closet, and it was seen there by my wife.

393 Mr. Macauley: Objected to as hearsay.

Mr. Allen: The answer of the witness is objected to as hearsay.

R. D. Q. 201. What did Mr. Barrows say, if anything, when he proffered you the money which you stated he gave you?

A. Well, he gave it in a very pleasant manner, and handed it over, and said: "Is that satisfactory?" and I said: "Entirely so."

R. D. Q. 202. And you say that prior to your signing the affidavit the question of money had not arisen in any way.

Mr. Allen: Objected to as leading, and improper re-direct examination.

A. He never mentioned any amount of money to me at all.

R. D. Q. 203. The day that you executed the affidavit, about what time did this occur? Was it before you went to work, or what time during the day?

A. You mean when I signed the affidavit?

R. D. Q. 204. Yes.

A. It was in the morning. I got excused from the office to go downtown, although Mr. Barrows said that he would call that evening if I wanted him to; but I said no, I would come downtown.

R. D. Q. 205. How long a time were you downtown?

A. Just long enough to sign the affidavit and take the elevated and get back to the office.

R. D. Q. 206. Do you know what was the occasion of your being subpœnæd rather than being invited to testify to-day?

Mr. Allen: Objected to as leading and suggestive.

394 A. I understood I was subpœnæd because there was objection by the official of our office at my obtaining a leave of absence, as the work that I am engaged in is of a special nature and no one else in the office has been educated up to take care of it; and in obtaining the subpœna I could show it to the official and he would raise no objection to my getting leave of absence.

R. D. Q. 207. You say that you received a long distance telephone call from your daughter, in which she conveyed a message from Procter & Gamble Company, that you had better get your money first before you executed an affidavit?

A. That telephone was to my wife in reply to a letter from her to my daughter, that I didn't know anything about, and they carried on the conversation themselves. I was standing near the telephone when my wife was speaking to my daughter, and she stated that it was at the expense of Procter & Gamble.

Mr. Allen: The answer of the witness is objected to as hearsay.

R. D. Q. 208. The expense of the telephone message was borne by Procter & Gamble Company?

A. Yes, sir; and it was since paid by them, twelve dollars.

Mr. MaCauley: Objected to as hearsay.

R. D. Q. 209. Was that the only telephone call by long distance, so far as you know, about this matter?

A. There were several calls, not only one, or of course it would not have been that amount of money.

R. D. Q. 210. Did you yourself engage in any of these long distance telephone conversations?

395 A. Only once; I took up the 'phone in talking with my daughter. She said that Procter & Gamble made the statement that I could tell all that I knew, and I made the remark to her, "Possibly it might be detrimental to them."

Mr. Allen: The answer of the witness is objected to as hearsay.

The Witness: That is an actual statement by myself.

Mr. Allen: It is evident what part of it is hearsay.

Mr. May: I think that is all.

Recross-examination.

By Mr. Allen:

R. X Q. 211. What is your salary at the present time, Mr. von Phul?

A. Ninety dollars a month and privileges of passes, etc.

R. X Q. 212. What do you mean by "privileges"?

A. Why, we obtain passes by length of service; for one to three years we obtain five hundred miles, from three to five years one thousand miles, from five to eight years unlimited mileage, and we receive at any time passes over our own system. I have been with the company nearly two years. After the expiration of another year they voluntarily raise my salary, with the pass privileges.

R. X Q. 213. They will do that, you mean?

A. Yes, sir.

R. X Q. 214. Do you have to travel very much in your business?

A. No, sir.

R. X Q. 215. Did you ask the official under whom you work whether you could come here to testify to-day?

A. I did.

R. X Q. 216. When did you ask him?

A. Last evening, after I had received the subpœna.

396 R. X Q. 217. Did you show him the subpœna?

A. I did.

R. X Q. 218. These long distance telephone calls were before Mr. Barrows telephoned you?

A. No, it was after the first call.

R. X Q. 219. The same day?

A. That evening—No, it couldn't have been. It must have been after, because my wife had written to my daugrter, and in answer to that letter they got the response; but it seems that I was called up when I was absent at the office, the first call.

R. X Q. 220. And you were told that?

A. Yes. Now, let me tell you, I recollect a little better in regard to that since you have recalled it. It seems that Mr. Barrows was in Cincinnati, and he went out to my brother's house——

Mr. Allen: I think this is all hearsay.

Mr. May: It is all right. He is giving you the answer, and I would like to have it go in. You can object to it afterwards if you want to.

A. He went out and he found he had got the wrong Mrs. von Phul, and he learned from my sister-in-law that I had a daughter living in Wyoming, and he called her up by telephone, and of course that stirred my daughter up in regard to it and then she had the conversation after that with my wife. The way it happened, Henry Steiner sells goods to Procter & Gamble, and he spoke to Mr. Burchenal in regard to Mr. Kayser. Mr. Burchenal asked, "What do you know about Mr. Kayser?" And then he told him about Mr. Barrows calling up his wife. Then he told him to tell his wife to call up, at Procter & Gamble's expense, my house in Chicago;

397 and that is the way the telephone started. I was thinking it was later.

Mr. Allen: The answer of the witness is objected to as purely hearsay.

R. X Q. 221. As I understand it, was it your wife that wrote down to Cincinnati in regard to this matter?

A. Yes. I made the error; I thought she wrote, but it comes back to me that Mr. Barrows was down there and telephoned to my daughter, and she told her husband, he telling Procter & Gamble, and Procter & Gamble had my daughter call up my wife over the long distance at their expense.

Mr. Allen: The answer of the witness is again objected to as merely hearsay.

R. X Q. 222. What I want to get at is whether this telephoning was done before or after Mr. Barrows' visit to your house?

A. I think it was before.

R. X Q. 223. Didn't you say that you thought it was afterwards?

A. I did; but, recalling the instance now of how my daughter had had the conversation—When I got home they were all excitement in regard to it. They got the idea in their head that Mr. Kayser had died and left me a big fortune, and that is the reason she was telephoning to her mother to find out about it.

R. X Q. 224. You say this was before Mr. Barrows telephoned you from Chicago?

A. Yes, sir.

R. X Q. 225. And before the visit that he made to your house?

A. Yes, sir. I am wrong. When I came home from the office they spoke about receiving a long distance telephone from my daughter, Mrs. Steiner, and also that there had been a call
398 from some person in Chicago. Shortly after I got home someone said that "there was a call for papa," and I went to the telephone.

R. X Q. 226. And that was from Mr. Barrows?

A. No, sir; that was from somebody here in Chicago representing Mr. Barrows.

R. X Q. 227. And you told that "somebody" that you would be at home?

A. Yes, sir.

R. X Q. 228. And Mr. Barrows then came out?

A. Mr. Barrows came out later.

R. X Q. 229. That evening?

A. Why, I am not satisfied in my own mind it was that evening. I think it was the next evening. I think Mr. Barrows was in Cincinnati, and he long-distance telephoned this man in Chicago, his representative, and he called up to see if I was the man they wanted.

R. X Q. 230. And when Mr. Barrows came out there you talked with him frankly?

A. Yes, sir.

R. X Q. 231. And told him all these things?

A. Told him everything I knew.

R. X Q. 232. This statement was written out?

A. Yes, sir.

R. X Q. 233. And signed by you?

A. Yes, sir.

R. X Q. 234. And then it was that Mr. Barrows produced the hundred dollars?

A. Yes, sir.

R. X Q. 235. And nothing had been said about any money until he produced the hundred dollars?

A. No, sir. He never said a word about money.

R. X Q. 236. And you didn't say anything?

A. No, sir. I never spoke about money.

R. X Q. 237. Notwithstanding the fact that it was prior to that time that you say you had been told about getting what money you could?

A. Yes, sir. I was not giving my testimony for money,
399 because I have not touched the hundred dollars. I have got it right now in the First National Bank of Englewood.

R. X Q. 238. You deposited the hundred dollars?

A. I deposited it in the savings department.

R X. Q. 239. What was it that you saw in the newspapers about litigation of the Procter & Gamble Company? What do you remember to have seen in the papers about some litigation?

A. I was just looking down the United States Court reports, because I am interested myself in the Pere Marquette Railroad. I have ten thousand dollars of bonds, and I was looking up the United States reports to see if any foreclosures was there, and I came across Procter & Gamble vs. somebody else.

R. X Q. 240. What else did it say besides that?

A. Well, just merely "Suit entered," I think, under such and such a Judge. I can't recall it now.

R. X Q. 241. Didn't say anything in that note anything about what the litigation was about?

A. No, not that I remember, anything special-y in regard to that.

R. X Q. 242. Well, did it say that it was patent litigation?

A. I can't recall that now. It only impressed itself on my mind because Procter & Gamble—I was so familiar with it.

R. X Q. 243. That they had brought suit against somebody up here?

A. Yes, sir.

R. X Q. 244. That is all that impressed itself on your mind?

A. Yes, sir.

R. X Q. 245. That is all you remember about what you saw in the newspaper?

A. Yes, sir.

R. X Q. 246. Then the first time you heard about any litigation on any food product patent was when Mr Barrows came out there to the house?

A. Yes, in regard to Mr. Kayser.

R. X Q. 247. That was the first time you learned anything about that?

A. Yes, sir.

400 R. X Q. 248. Is that the first time you knew there was any such patent in existence?

Mr. May: Such patent as what, Mr. Allen?

Mr. Allen: I am asking the witness.

A. I knew that Mr. Kayser had got a patent for his food product.
R. X Q. 249. You knew that?
A. Yes, sir.
R. X Q. 250. When did you learn that?
A. Well, when he lived in Wyoming.
R. X Q. 251. He told you he had got patents for his inventions?
A. Yes, for his invention, and he was worried at one time in regard to——
R. X Q. 252. Whether he could get the patent?

Mr. May: Let him answer his question, Mr. Allen, if you please.

A. Whether he could get through with Procter & Gamble. It seems they had some trouble out there at that time about it.
R. X Q. 253. He was not worried about getting a patent at any time?
A. No; he was never worried about that, only worried about his contract with Procter & Gamble.
R. X Q. 254. When Mr. Barrows came out there at the time you gave him your statement, he told you that there was some litigation about this Kayser patent?
A. Yes, sir.
R. X Q. 255. And he wanted to know the facts?
A. He wanted to know what I knew about it.

Redirect examination.

By Mr. May:

R. D. Q. 256. You said that you deposited that hundred dollars in the savings bank?
A. Yes, sir.
401 R. D. Q. 257. Approximately how much money have you on deposit?
A. I have only that hundred dollars.
R. D. Q. 258. In the savings bank?
A. Yes, sir.
R. D. Q. 259. And you said you had ten thousand dollars' worth of bonds of the Pere Marquette Railroad?
A. Yes, sir. I have some Cincinnati Street Railway, too.
R. D. Q. 260. Do you depend upon the compensation you receive from the railroad?
A. Partly.
R. D. Q. 261. You have other resources?
A. Yes, sir.

Recross-examination.

By Mr. Allen:

R. X Q. 262. What income do you get from your Pere Marquette bonds?

A. Four per cent., four hundred dollars a year.

R. X Q. 263. What bonds are they?

A. They are the refunding bonds guaranteed by the C. H. & D. Railroad.

R. X Q. 264. What is their par value?

A. One thousand dollars.

R. X Q. 265. What is their market value?

A. That is problematical. They are in the hands of a receiver now.

R. X Q. 266. Have they any market value now?

A. The latest quotation, I think, was twenty-nine and three-quarters.

R. X Q. 267. Have you been getting your four per cent. right along?

A. The Baltimore & Ohio Railroad paid the coupons up to January, 1914. The Pere Marquette Road went into the hands of a receiver in May, 1912. Mr. Willard, the president of the Baltimore & Ohio Railroad, was called to Washington before the Interstate Commission and asked what connection he had with the C. H.
402 & D. Railroad, and after that he refused to pay the coupons.

R. X. Q. 268. And they have not been paid since?

A. No, sir, for two years. They owe me twelve hundred dollars January first, back interest.

R. X Q. 269. What is your other source of income, Mr. von Phul?

A. Well, I have a small income from the Cincinnati Street Railroad, and we have a young man that is stopping at the house, that my wife took about seven years ago, and he pays his board.

R. X Q. 270. How much of an income do you make from the Cincinnati Street Railroad?

A. It is only two shares, six dollars a year.

R. X Q. 271. And that is all of your outside source of income?

A. At the present time; yes, sir.

Redirect examination.

By Mr. May:

R. D. Q. 272. Did the question of your salary or your income arise during your talk with Mr. Barrows?

Mr. Allen: The question is objected to as leading, and improper re-direct examination.

A. No, sir.

Mr. May: That is all.

Mr. Allen: That is all.

Deposition closed.

CLARENCE von PHUL.

Susbcribed and sworn to before me this 28th day of October, 1916.

ALICE M. RANKIN,
Notary Public.

403 CHICAGO, October 25, 1916,
2:00 o'clock p. m.

Parties met pursuant to recess.
Present—Counsel as before.

KATHRYN J. VON PHUL, a witness produced on behalf of the defendant, having been first duly sworn, deposes and says as follows; in answer to oral interrogatories:

Direct examination.

By Mr. May:

Q. 1. Will you be so good as to state your full name, Mrs. von Phul?
A. Kathryn J. von Phul.
Q. 2. And you reside where?
A. In Chicago; 7157 Yale Avenue.
Q. 3. And you are of legal age?
A. Fifty-six.
Q. 4. And you are the wife of Mr. Clarence von Phul?
A. Yes.
Q. 5. Were you subpœnaed to testify in this case, Mrs. von Phul?
A. No, I was not.
Q. 6. Mrs. von Phul, were you acquainted with a gentleman named Edwin Cuno Kayser?
A. Yes, sir.
Q. 7. Under what circumstances and when did you become acquainted with him?
A. In the first part of November, 1907. He came to my house in answer to an advertisement that I had put in for a furnished room.
Q. 8. And where were you living at that time?
A. 3553, I think that was the number; Bogart Avenue.
Q. 9. Cincinnati?
A. Cincinnati, Ohio.
Q. 10. And what occurred then, when Mr. Kayser came to see you in response to your advertisement?

404 A. Well, he took the room, and there was nothing that I knew more about him. He told me that he was employed by Procter & Gamble at the time. He didn't say what his employment was, but later on said he was putting up machinery there to invent something he was making; didn't say what it was but later on it proved he was making something to take the place of lard.

Q. 11. How long did Mr. Kayser live with you?
A. Well, from the first part of November, 1907, until the latter part of March, 1908.
Q. 12. How long had you been living at that house on Bogart Avenue?
A. About the first week in September we moved out there.
Q. 13. And when did you move from there?

A. The latter part of March. We moved to Wyoming the first of April in 1908.

Q. 14. Where had Mr. von Phul been during the summer of 1907?

A. Why, he went to Chicago in July of that year, I think it was in July, and didn't get back until about the middle of November.

Q. 15. Can you fix the time when Mr. von Phul returned?

A. I think it was about the fifteenth or sixteenth of November.

Q. 16. And how do you fix that date?

A. I fix it by my birthday.

Q. 17. When was your birthday?

A. The sixteenth of November.

Q. 18. And how does that help to fix the time when he came back?

A. Well, I remember him saying he hadn't brought me a birthday present, but he gave me a gold piece, and that was very vivid in my memory.

Q. 19. Was Mr. Kayser living at your house when Mr. von Phul returned?

A. Yes, sir.

Q. 20. You made some remark about something that Mr. Kayser was working on. When did you learn what it was that he
405 was working on?

A. Well, he told me that they were putting up machinery at Procter & Gamble's for his invention, and that they were slow about it. He was getting quite discouraged and thought he couldn't have the help he wanted. All he had was an old German that couldn't speak any English and didn't know very much, just simply could help him.

Q. 21. Did you subsequently learn what it was Mr. Kayser was working on?

A. After he had been there a while he told Mr. von Phul what he was working on.

Mr. Allen: The question is objected to.

Mr. May: Let her finish her answer. If you will be good enough to let the witness finish her answers before you interrupt with your objections.

Mr. Allen: I thought she was through.

A. He told Mr. von Phul he was making this invention, something out of cottonseed, to take the place for cooking, and later on I saw the sample.

Mr. Allen: The answer of the witness is objected to as hearsay and stating what Mr. Kayser told Mr. von Phul.

Q. 22. How did you learn what Mr. Kayser told Mr. von Phul?

A. Mr. von Phul told me.

Mr. Allen: The objection is repeated, as hearsay.

Q. 23. When did you see this sample that you refer to?

A. Well, it must have been in January sometime, it was very cold weather at the time.

406 Q. 24. How did you happen to see it?

A. I saw it on a shelf in the closet when I was in the room.

It was a small room next to his and had some shelves in it, and this was in the closet on a shelf, and later on Mr. von Phul showed me that sample and said that was what he was working on, and I said: "Well, I certainly wouldn't want to use that cooking; it don't look good to me; looks more like tallow."

Mr. Allen: The answer of the witness is objected to as hearsay, relating to what Mr. von Phul told her.

Q. 25. Did Mr. Kayser make many friends while he was staying with you?

A. No; none at all. He stayed at home all the time. He never seemed to make any friends.

Q. 26. With whom did he talk most if anybody?

A. Mr. von Phul. Mr. von Phul would sit with him in his room at night. Of course I was with my family; and they would talk over different matters.

Q. 27. Did Mr. von Phul do anything for Mr. Kayser?

A. He made some drawings.

Q. 28. Did you see those drawings?

A. I saw them tacked on a board in the room.

Q. 29. I don't suppose you knew what those drawings showed?

A. No, I didn't pay any attention to them. I don't know what they were, but I knew they were for the machinery for this invention.

Q. 30. When was it, with reference to the time you saw this sample,or material that looked like tallow,that you saw the drawings? Was it before you saw the sample that you saw the drawings, or before you saw the drawings that you saw the samples?

A. That, I couldn't say.

Q. 31. You don't remember?

A. I don't remember just exactly, but I think it was after
407 I saw the sample.

Q. 32. When was it that Mr. von Phul told you that this material, this tallow-like material which you saw, was intended to be used by Mr. Kayser for cooking purposes?

Mr. Allen: Objected to as hearsay.

A. Well, it must have been the first part of January or the last of December. It might have been a little earlier than that, I don't remember, but I know it was about that time that he was busiest with the drawings.

Mr. May: That is all.

Mr. Allen: I do not care to cross-examine.

Deposition closed.

KATHRYN J. VON PHUL.

Subscribed and sworn to before me this 28th day of October, 1916.

ALICE M. RANKIN,

[SEAL.] *Notary Public.*

Mr. May: The previous witness states that upon examining the records of the Rock Island Railroad Company he is advised that their records show that he appears to have begun to work for the railroad company on August 5, 1907, and that on December 15, 1907, it is noted that he left the employ of the company; that when he went to Cincinnati he had a month's leave of absence, so that this would place his leaving Chicago for Cincinnati as approximately November 15, 1907.

Which were all the proceedings had at the time and place above indicated.

408 *Notary's Certificate.*

In the District Court of the United States, Southern Distirct of New York.

In Equity. No. 13—100.

PROCTER & GAMBLE COMPANY, Plaintiff,

vs.

BERLIN MILLS COMPANY, Defendant.

On Burchenal Patent No. 1,135, 351.

STATE OF ILLINOIS,
County of Cook, ss:

I, Alice M. Rankin, a Notary Public within and for the County and State aforesaid, duly commissioned and authorized to administer oaths and to take and certify depositions, acting as Special Examiner by consent of counsel, do hereby certify that the foregoing depositions of the aforenamed witnesses, Clarence von Phul and Kathryn J. von Phul, were taken by me de bene esse, on behalf of the defendant in the above entitled cause, pursuant to agreement of counsel and under and in accordance with the provisions of the Statutes of the United States in such case made and provided; that the depositions were taken at my office, No. 1608 First National Bank Building, in Chicago, Illinois; that each of the aforenamed witnesses, who were of sound mind and lawful age, was by me first carefully
409 sworn and cautioned and duly sworn according to law to testify the truth, the whole truth and nothing but the truth, before the commencement of his or her testimony; that said witnesses thereupon respectively testified as is set forth in their said depositions; that the depositions of said witnesses were taken stenographically from the dictation of said witnesses by myself and myself reduced to writing; that the plaintiff was represented at the taking of said depositions by Alfred M. Allen, Esquire, and J. B. Macauley, Esquire, and the defendant by Marcus B. May, Esquire, and Frank E. Barrows, Esquire, as appears in the record; that the depositions were taken at the place agreed upon by counsel and by agreement of coun-

sel, on Wednesday, 25th October, 1916, commencing at 10:00 o'clock a. m., as appears in the record; that each of said witnesses read over his or her deposition thus given before signing the same and then signed the same in my presence, and that I duly attested the signatures of said witnesses.

I do further certify that the reason for taking such depositions was and is that each of said named witnesses resides in Chicago, Illinois, more than one hundred miles from the place where said cause is appointed by law to be tried; that I am neither of counsel nor attorney to either of the parties, nor connected by blood or marriage to either of the parties to this cause, nor interested directly or indirectly in the matter in controversy or in the event or result of this cause; that the said depositions have remained exclusively in my possession from the time they were taken until the time of their transmission to the Clerk of the United States District Court for the Southern District of New York, and that it being impracticable for me to deliver said depositions with my own hand unto the
410 Court for which they have been taken, I have retained the same for the purpose of sealing them and after so sealing them have directed them with my own hand and speedily and safely transmitted the same to said Court for which said depositions were taken and there to remain under my seal until opened.

Witness my hand and seal as such Special Examiner, at Chicago, Illinois, on this 27th day of October, 1916.

ALICE M. RANKIN,
[SEAL.] *Notary Public and Special Examiner.*

411 United States District Court, Southern District of New York.

In Equity. No. 13—100.

PROCTER & GAMBLE COMPANY, Plaintiff,

vs.

BERLIN MILLS COMPANY, Defendant.

On Patent No. 1,135,351.

Bill of Complaint.

The plaintiff for its bill of complaint alleges:

I. That plaintiff is a corporation duly organized and existing under the laws of the State of Ohio, having its principal place of business at Cincinnati, in said State; and that the defendant, Berlin Mills Company, is a corporation duly organized and existing under the laws of the State of Maine, with its principal office in the City of Portland, in said State, and having a regular and established place of business in the City of New York, State of New York, in said South-

ern District of New York, where the acts of infringement alleged herein have been committed.

II. That this suit is brought under the Patent Laws of the United States for the infringement by the defendant of the United States patent numbered 1,135,351, granted April 13, 1915.

III. That on the 10th day of November, 1910, John J. Burchenal, being, within the meaning of the statutes of the United
412 States then in force, the inventor of a certain Food Product, and being entitled to a patent therefor under the provisions of the said statutes, duly filed in the United States Patent Office an application for Letters Patent for such invention, and thereafter duly assigned the said invention and the said application for Letters Patent therefor to The Proctor & Gamble Company; and that on the 13th day of April, 1915, all of the requirements of the said statutes having been complied with, Letters Patent of the United States No. 1,135,351 were duly issued on said application to The Proctor & Gamble Company.

IV. That since said Patent No. 1,135,351 was assigned to it, the plaintiff has been, and now is, the sole and exclusive owner of the said patent.

V. That the plaintiff is informed and believes, and therefore avers, that the defendant is now infringing and, since the grant of the said patent and prior to the filing of this bill, has infringed upon said Letters Patent, by manufacturing, selling and using within the Southern District of New York, as well as elsewhere within the United States, the food product described and claimed in said Letters Patent No. 1,135,351, and defendant threatens to continue to carry on such infringement, whereby the plaintiff has been and will be damaged.

VI. That the defendant was duly notified of its infringement of said Letters Patent No. 1,135,351; but nevertheless, as plaintiff is informed and believes, and therefore avers, defendant continued to infringe since said notice, whereby defendant has profited and the plaintiff has been damaged.

The plaintiff therefore prays:

413 (1) For a writ, or writs, of injunction (and a preliminary writ, or writs, of injunction pending this suit), restraining the defendant, its agents, employees, and all others acting under its authority, from further infringing said Letter- Patent.

(2) For costs of this suit, and an account of profits and damages resulting from said infringement, and that any damages assessed may be tripled.

(3) For such other and further relief as the circumstances of the case may require.

THE PROCTOR & GAMBLE CO.,
By JOHN J. BURCHENAL, *V. P.*
KERR, PAGE, COOPER & HAYWARD,
Solicitors for Plaintiff.

THOMAS B. KERR,
ALFRED M. ALLEN,
Of Counsel.

STATE OF OHIO,
County of Hamilton, ss:

On this 10th day of December, 1915, before me, the undersigned authority, personally came John J. Burchenal, who, being by me duly sworn, did depose and say that he is the Vice-President of The Proctor and Gamble Company, the plaintiff herein; that he has read the foregoing bill of complaint; that the statements therein contained are true of his own knowledge, except so far as they are
414 alleged to be stated on information and belief, as to which statements he believes them to be true; that he believes the said John J. Burchenal to be the original, true and first inventor of the invention described in the Letters Patent No. 1,135,351; and that the plaintiff's title to said etters Patent is as set forth in the bill.

JOHN J. BURCHENAL.

Subscribed and sworn to before me this 10th day of December, 1915.

[SEAL.]

GUY B. TAYLOR,
Notary Public in and for Hamilton County, Ohio.

Answer.

The answer of the defendant, Berlin Mills Company, to the above entitled action is as follows:

I. The defendant admits the allegations of the paragraph marked I in the bill of complaint.

II. The defendant admits that Letters Patent of the United States No. 1,135,351, were issued on April 13, 1915, to The Proctor & Gamble Company, on an application of John J. Burchenal, filed November 10, 1910; but the defendant, on information and belief, denies that the said Burchenal was the inventor of the food product described in said patent, denies that said Burchenal was entitled to a patent on the said application, denies that the said Burchenal complied with all of the requirements of the then existing statutes, and denies that said Letters Patent were or are valid.

415 III. Except for the allegation set forth in the paragraph marked III in the bill of complaint, the defendant has no

knowledge whether or not the said Burchenal assigned the alleged invention and the said application to The Procter & Gamble Company, and leaves the plaintiff to make such proof thereof as it may be advised is material or necessary.

IV. Except for the allegation set forth in paragraph marked IV of the bill of complaint, this defendant has no knowledge as to whether or not the plaintiff has been and is now the sole and exclusive owner of the said Letters Patent No. 1,135,351, and leaves the plaintiff to make such proof thereof as it may be advised is material or necessary.

V. The defendant denies that it is now infringing or ever has infringed upon the said Letters Patent No. 1,135,351, in any manner whatsoever; denies that it has manufactured, sold or used, or is now manufacturing, selling or using, within the Southern District of New York or elsewhere within the United States the food product described and claimed in said Letters Patent No. 1,135,351; the defendant denies that it threatens to carry on or undertake any such infringement; and the defendant further denies that the plaintiff has been damaged or will be damaged by any act of the defendant.

VI. The defendant admits that, prior to the filing of the bill of complaint, it received a letter charging it with infringement of Letters Patent No. 1,135,351, but denies that since the receipt
416 of the said letter it has infringed said Letters Patent; denies that it has profited by any such infringement, and denies that the plaintiff has been damaged by any act of the defendant since the receipt of said letter.

VII. The defendant further answering, on information and belief, avers that said Letters Patent No. 1,135,351 and all of the claims thereof are void as lacking in patentable novelty.

VIII. The defendant further answering, on information and belief, charges and avers that, for the purpose of deceiving the public, the description in the specification of the said Letters Patent No. 1,135,351, filed by John J. Burchenal in the United States Patent Office, was made to contain less than the whole truth relative to his alleged invention or discovery; and that the specification and claims thereof are uncertain, vague and indefinite; that the claims are so nebulous that they are calculated to deceive the public; wherefore said Letters Patent and each and every of the claims thereof are void and of no effect in law.

IX. Upon information and belief, the defendant alleges that the said John J. Burchenal had surreptitiously or unjustly obtained the said Letters Patent No. 1,135,251, for that which was in fact invented, if said Letters Patent disclose, describe or claim any invention, by another who was using due diligence in adapting and perfecting the same, to wit: Edwin Cuno Kayser, of Cincinnati, Ohio.

X. The defendant further answering, on information and belief,

avers that the alleged invention or improvement as patented
417 in and by said Letters Patent No. 1,135,251, and particularly as pointed out in the claims thereof, did not, in view of the prior state of the art at the time that the same was alleged to be made, constitute patentable improvement and invention within the meaning of the Patent Law, and that the said Letters Patent and each of the claims thereof did not describe or claim legally patentable subject matter, invention or discovery; wherefore the said Letters Patent and each and every of the claims thereof are void and of no effect in law.

XI. The defendant further answering, on information and belief, avers that the said Letters Patent No. 1,135,351, and each and every of the claims thereof are void for that the alleged invention and improvement therein described and claimed, and every material and substantial part thereof claimed therein as new, were, prior to the date of the alleged invention and improvement, fully, exactly and clearly shown, described and claimed in the following prior Letters Patent, and fully, exactly and clearly shown and described in the following printed publications, to wit:

United States Letters Patent.

826,089	dated	July 17, 1906	to	Day,		
949,954	"	Feb. 22, 1910	"	Bedford,		
974,182	"	Nov. 1, 1910	"	Phelps,		
1,001,279	"	Aug. 22, 1911	"	Kayser,	filed	Dec. 27, 1909
1,004,034	"	Sep. 26, 1911	"	Kayser,	"	Jan. 10, 1908
1,004,035	"	Sep. 26, 1911	"	Kayser,	"	Mar. 20, 1908
1,008,474	"	Nov. 14, 1911	"	Kayser,	"	Feb. 18, 1910

418 Foreign Letters Patent.

British	821/1855	to	Brooman
"	3021/1874	"	Brown
"	2798/1883	"	Lake
"	7242/1901	"	Ramage
German	141,029	"	Herforder Maschinenfett & Oelfabrik
British	1515/1903	"	Normann
"	1572/1905	"	deHemptinne
"	12525/1905	"	deHemptinne
German	164,154	"	Dreymann
"	167,107	"	deHemptinne
"	172,690	"	Knorre
"	187,788	"	Boehringer
"	189,332	"	Boehringer
British	2520/1907	"	Bedford
"	13042/1907	"	Crossfield
German	199,909	"	Schwoerer
"	211,669	"	Erdmann
British	9112/1908	"	Bedford
French	394,957	"	Paul Sebattier

Publications.

Reduction of the Unsaturated Linoleic Acids to Stearic Acids, Thesis by Fred Bedford, University of Halle, Germany, 1906.

Metals as Catalyzers in Organic Cremistry, by Ludwig Taub, Zeitschrift für Angewandte Chemie, January 1910, page 145.

New General Method of Hydrogenation, etc., by Paul Sebatier and J. B. Senderens, Annales de Chemie, 8th Series, Vol. IV, page 319 et seq., 1905.

Zeitschrift für Untersuchund der Nahrungs und Genussmittel, 1912, Vol. 24, page 104.

419 Comptes rendus hebdmadaires des seances de l'academie des sciences. Vol. 141, page 1245, Dec. 20, 1905, Leon Brunnel.

Annales de Chimie et de physique. 8th Series, Vol. 6, page 204. 1905 Leon Brunnel.

Journal of the Russian Physical-Chemical Society, Vol. 38, page 419 et seq., and page 855 et seq., 1906, Vol. 39, page 607, 1907; and Vol. 40, pages 276-321, 1908; S. Fokin.

The Chemical News and Journal of Physical Science, Vol. 58, page 103, 1888. S. Cooke.

Berichte der Deutschen chemischen Gesellschaft, Vol. 41, pages 1475-1480, and page 2199 et seq., Willstaetter and Mayer.

Berichte der Deutschen chemischen Gesellschaft, Vol. 41, page 2282 et seq., Jan. 15, 1908, Paal and Roth.

Berichte der Deutschen chemischen Gesellschaft, Vol. 41, page 2273 et seq., Jan. 15, 1907, Paal & Gerum.

Zeitschrift für Elektrochemie und angewandte physikalische chemie, Vol. 12, page 756, 1906, Fokin.

Berichte der Deutschen chemischen Gesellschaft, Vol. 42, page 1541 et seq., Paal and Roth, 1909.

Berichte der Deutschen chemischen Gesellschaft, Vol. 40, page 2209 et seq., Paal and Gerum, 1907.

Berichte der Deutschen chemischen Gesellschaft, Vol. 42, page 1324 et seq., Erdman and Bedford, 1909.

Zeitschrift für angewandte chemie und Zentralblatt für technische chemie, Vol. 22, pages 1451-1459, and 1492-1502, S. Fokin, 1908.

Annales de chemie et de Physique, 8th Series, Vol. 16, pages 70-107, Sabatier and Maihle, 1909, and in other Letters Patent and printed publications, the numbers, names and dates of which

420 this defendant is not able at this time to give, but prays leave to add by way of amendment as soon as able so to do.

XII. The defendant, on information and belief, charges and avers, that the said Letters Patent No. 1,135,351, and each and every of the claims thereof are void for that the alleged invention and improvement therein described and claimed, and every substantial and material part thereof claimed therein as new, were, prior to the date of the alleged invention and improvement, known and used by, or were in public use or on sale more than two years prior to the filing

of the said application for Letters Patent by the following persons, firms and corporations, to wit:

Edwin Cuno Kayser, of Cincinnati, Ohio, at Cincinnati, Ohio, and elsewhere in the United States;

The Procter & Gamble Company and its officers and employees, of Cincinnati, Ohio, at Cincinnati, Ohio, and elsewhere in the United States;

John J. Burchenal, of Cincinnati, Ohio, at Macon, Georgia, and elsewhere in the United States; and by other persons, firms and corporations, the names of whom this defendant is not able at this time to give, but prays leave to add by way of amendment hereto, as soon as able so to do.

XIII. The defendant denies the equity of the plaintiff's bill of complainant and alleges that the plaintiff is not entitled to an injunction nor to damages, nor to an account of profits, nor to any relief or recovery whatsoever against this defendant, as prayed in the said bill of complaint.

All of which matters and things this defendant is ready to
421 aver, maintain and prove as this Honorable Court shall direct, and prays that the bill of complaint be dismissed, and that the defendant shall recover its costs and disbursements in this suit.

BERLIN MILLS COMPANY,
By O. B. BROWN,
Its Vice President.

MARCUS B. MAY,
Of Counsel for Defendant.

JOHN C. PENNIE,
Solicitor for Defendant.

STATE OF NEW YORK,
County of New York, ss:

O. B. Brown, being duly sworn, deposes and says that he is the Vice Prseident of Berlin Mills Company, the defendant named in the foregoing answer; that he has read the said answer and knows the contents thereof, and that the same is true of his own knowledge except as to matters therein stated to be on information and belief, and as to such matters he verily beleives it to be true.

O. B. BROWN.

Sworn to and subscribed before me this 11th day of January, 1916.

G. H. RAYMOND,
[SEAL.] *Notary Public, Kings County.*

Certificate filed N. Y. Co., No. 126. N. Y. Register, No. 6210.

Commission expires March 30, 1916.

422 *Order (Amendment to Answer.)*

On motion of John C. Pennie, Esq., solicitor for the defendant herein.

It is ordered, that the answer of the defendant filed on the 14th day of January, 1916, be, and the same hereby is, amended as follows:

After Paragraph X on page 3, insert the following:

X*a*. The defendant further answering, on information and belief, avers that claims 1 and 2 of said Letters Patent No. 1,135,351 set forth subject-matter which is different from that which was described and claimed as the applicant's invention in the application for said Letters Patent as originally filed in the United States Patent Office; and that the patentee, John J. Burchenal, did not file in the Patent Office with his said application or at any other time, an oath alleging that he believed himself to be the original and first inventor of the subject-matter of claims 1 and 2 of said Letters Patent No. 1,135,351, as required by law, wherefore said claims are void and of no effect in law.

X*b*. The defendant further answering, on information and belief, avers that claims 1 and 2 constitute an enlargement of the specification of said application as originally filed in the United States Patent Office by said John J. Burchenal, such as would enable the patentee to appropriate that which, prior to the addition or insertion of said claims in said application, had gone into public use, or which had been invented by others, wherefore said claims are void and of no effect in law, or else if valid are so restricted as not to be infringed by the defendant's product.

X*c*. The defendant further answering, on information and
423 belief, avers that, by reason of the rejections of the claims of the application for said Letters Patent No. 1,135,351, by the Commissioner of Patents, the acquiescence of the applicant in such rejection, the amendments of the claims of the application by the applicant and the statements of the applicant filed in the Patent Office in connection with amendments of the application, the plaintiff is now estopped from alleging that claims 1 and 2 of the Letters Patent in suit No. 1,135,351, are valid, or, that if valid, they are infringed by any food product made, used or sold by the defendant.

X*d*. The defendant further answering, on information and belief, charges and avers that the patentee, said Burchenal, failed or neglected to state in such full, clear, concise, and exact terms, the manner and process of making, constructing and compounding, the said food product set forth and claimed in claims 1 and 2 of said Letters Patent, as to enable one skilled in the art to make, construct, or compound the same.

In Paragraph XI on page 5, change the citations of publications reading as follows:

"Zeitschrift für Elektrochemie und angewandte Physikalische Chemie, Vol. 12, page 756, 1906, Fokin.

Journal of the Russian Physical-Chemical Society, Vol. 38, page 419 et seq., and page 855 et seq., 1906; Vol. 39, page 607, 1907; and Vol 40, pages 276-321, 1908; S. Fokin.

Berichte der Deutschen chemischen Geseilschaft, Vol. 41, page 2282 et seq., Jan. 15, 1908, Paal and Roth.

Berichte der Deutschen chemischen Gesellschaft, Vol. 42,
424 page 1541 et seq., Paal and Roth, 1909."

So as to read:

"Zeitschrift für Elektrochemie, published at Halle, Germany, Vol. 12 (year 1906, pages 749 to 762 inclusive. Article by Fokin.

Journal of the Russian Physical-Chemical Society, (published in the Russian language at St. Petersburg, Russia), Vol. 38, (year 1906); pages 419 to 446 inclusive, and pages 855 to 858, inclusive; Vol. 39 (year 1907), pages 607 to 609 inclusive; and Vol. 40 (year 1908), pages 304 to 321 inclusive. Articles by Fokin.

Berichte der Deutschen Chemischen Gesellschaft, published at Berlin, Germany, Vol. 41 (year 1908), pages 2282 to 2291 inclusive; and Vol. 42 (year 1909), pages 1541 to 1553 inclusive."

MARTIN D. MANTON,
United States District Judge, New York, N. Y.

We hereby consent to the entry of the foregoing Order.
KERR, PAGE, COOPER & HAYWARD,
Counsel for Plaintiff.

425 *Defendant's Interrogatories and Plaintiff's Answers Thereto.*

STATE OF NEW YORK,
County of New York, ss:

JOHN J. BURCHENAL, being duly sworn, deposes and says that he is the Vice President and General Manager of The Procter & Gamble Company, the plaintiff in the above entitled suit, and the inventor of the patent No. 1,135,351 sued on, and that he has read the interrogatories 16-26 inclusive, to which the plaintiff was ordered to file its answer under order of March 27th, 1916, and he believes that the following are true answers thereto:

Q. 16. Can the product of the patent in suit be made by treating crude cottonseed oil in the manner referred to in lines 75 to 94 of page 1, of the patent in suit?

A. Never having treated crude cottonseed oil in the way indicated I cannot answer this question.

Q. 17. If unrefined crude oil is treated as described in lines 75 to 94 of page 1 of the patent in suit, will the hydrogenized oil, without after treatment or purification, be a food product suitable for use as a shortening, as described in the patent in suit?

A. Same answer as above.

Q. 18. How is the amount of hydrogen absorbed by the oil carefully regulated and limited, as stated in lines 75 to 78, and lines 87 to 89, of page 1 of the patent in suit?

A. The amount of hydrogen is regulated by making a test of the material from time to time and stopping the absorption of hydrogen when the material has reached the described qualities.

Q. 19. What must be the pressure of the atmosphere of
426 compressed hydrogen, referred to in lines 81 to 82 of page 1 of the patent in suit in order to produce the product described and claimed therein?

A. Having tried a great many pressures, we have never found any pressure that would not work.

Q. 20. What is the "considerably higher temperature than lard" to which the product, as stated in lines 97 to 100 of page 1 of the patent in suit, can be heated without smoking or burning; and by how much, if any, does such temperature exceed the temperature to which the same cottonseed oil before hydrogenizing can be heated without smoking or burning?

A. As to the first part of the question: This will differ in different examples of the product. We have never determined it for all possible examples. I understand that differences of from 10° to 50° F. have been observed in different products. As to the second part of the question, I have never tried cottonseed oil.

Q. 21. Does the food product described and claimed in the patent in suit contain all of the finely divided nickel which is maintained in suspension in the oil during its absorption of hydrogen, as stated in lines 82 to 85 of page 1 of the patent in suit?

A. In our opinion, no, as would be well known in the art of rising catalytic agents; subject to any different interpretation that the Court may place on the claims.

Q. 22. Must the finely divided nickel which is maintained in suspension in the oil during its absorption of hydrogen, as
427 stated in lines 82 to 85 of page 1 of the patent in suit, be completely removed from the oil in order that the hydrogenized product shall be a food product suitable for use as a shortening.

A. Any catalytic that may be used must be absent from the finished product as would be well known in the art of using catalytic agents.

Q. 23. Is it necessary, either that the formation of nickel soaps during the hydrogenizing should be prevented, or that any nickel soaps formed during the hydrogenizing should be removed, in order that the product shall be a food product suitable for use as a shortening?

A. We have never used any means to prevent the formation of nickel soaps and have never experienced the formation of any.

Sept. 23, 1916.

Q. 24. Must the cottonseed oil be freed from free fatty acids, either before or after the hydrogenizing treatment referred to in lines 75 to

94 of page 1 of the patent in suit, in order that the product shall be a good product suitable for use as a shortening?

A. There has never been any free fatty acid substantially in any material used by us in the manufacture of our products.

Q. 25. Must the product resulting from the treatment referred to in lines 75 to 94 of page 1 of the patent in suit be subjected to any further treatment or purification whatsoever in order that the product shall be a food product suitable for use as a shortening, as described and claimed in the patent in suit?

428 A. No, deodorizing and filtering being implied to a man skilled in the art by the description referred to in the question.

Q. 26. What further treatment, or purification, if any?

A. Same answer as to answer 25.

JOHN J. BURCHENAL.

Subscribed and sworn to before me this 8th day of April, 1916.

M. LAWSON DYER,

[SEAL.] *Notary Public*, 119,
N. Y. Co., N. Y.

Stipulation.

It is hereby stipulated and agreed by and between the parties to the above entitled suit, by their respective counsel, that the depositions de bene esse of John J. Burchenal, Wallace Eugene McCaw and Albert Edward Anderson heretofore taken herein on behalf of the defendant in Cincinnati, Ohio, on October 4th to 10th inclusive, 1916, under the provisions of Section 863 of the Revised Statutes of the United States and under order of the Court dated September 23, 1916, may be received and admitted in evidence, with the same force and effect as if the witnesses had appeared and given such testimony orally in open court at the trial of this cause (notwithstanding that any or all of said witnesses should be present or otherwise available at said trial or should give additional testimony at the trial), all objection and exception to the admissibility of such depositions de bene esse being hereby expressly waived.

And it is further hereby stipulated and agreed that the
429 above stipulation and agreement shall likewise extend to the depositions de bene esse of William Cooper Procter, John J. Burchenal, Albert Edward Anderson, Wallace Eugene McCaw, Harley J. Morrison and James M. McCaw, taken in Cincinnati, Ohio, on October 19th to 27th inclusive, 1917, in the case of Procter & Gamble vs. Swift & Co. (pending in the District Court for the Northern District of Illinois, Eastern Division) which depositions counsel for the respective parties herein have heretofore stipulated and agreed shall be received and admitted as evidence herein with the same force and effect as if originally taken herein under the aforesaid order of the Court herein dated September 23, 1916.

It is further stipulated and agreed that any printed publication or publications that may be offered in evidence herein, shall be re-

garded as having been printed and published upon the respective dates appearing upon said publication or publications, or upon the title page of the bound volume, or individual number, in which the publication may appear, subject to correction; and that photographic or photostatic copies of such publications and of the title pages of the bound volumes or individual numbers in which they appear may be received in evidence with the same force and effect as originals, subject to correction of any errors therein by the production of the originals or certified copies thereof.

KERR, PAGE, COOPER & HAYWARD,
Solicitors for Plaintiff.
JOHN C. PENNIE,
Solicitor for Defendant.

New York, N. Y., March 15, 1917.

430 United States District Court, Southern District of New York.

In Equity. 13—100.

THE PROCTER & GAMBLE COMPANY, Plaintiff,

vs.

BERLIN MILLS COMPANY, Defendant.

On Burchenal Patent No. 1,135,351.

Before Hon. Augustus N. Hand, District Judge.

NEW YORK, Thursday, March 22, 1917.

Appearances:

Livingston Gifford, Esq., Alfred M. Allen, Esq., and Thomas B. Kerr Esq. for Plaintiff.
John C. Pennie Esq., and Marcus B. May, Esq., for Defendant.

NEW YORK, March 22nd, 1917—10:30 A. M.

Trial resumed.

Plaintiff's Prima Facie Proofs.

Mr. Gifford: If your Honor please, plaintiff offers in evidence the patent in suit No. 1,135,351 dated April 13th, 1915, to John J. Burchenal assignor to the plaintiff, on an application filed November 10th, 1910, for food products.

Marked Plaintiff's Exhibit 1.

431 Also the stipulation dated March 17th, 1917, and the can and the exhibits referred to in the stipulation.

Marked Plaintiff's Exhibit 2.

Mr. Pennie: I offer in evidence the stipulation dated March 15th, 1917, with regard to the testimony taken on Commission.

Marked Defendant's Exhibit A.

CHARLES BASKERVILLE, a witness called on behalf of the plaintiff, being duly sworn, testifies as follows:

Direct examination.

By Mr. Gifford:

Q. 1. What is your name?
A. Charles Baskerville.
Q. 2. What is your age?
A. Forty-six.
Q. 3. And your residence?
A. New York City.
Q. 4. Occupation?
A. Professor of Chemistry.
Q. 5. What education and experience have you had qualifying you to testify as an expert in a case relating to food products in particular?
A. I am a graduate of the Universities of Virginia and North Carolina; was an advanced student at Berlin University. I have worked a good deal on refining vegetable and animal oils; have secured a number of patents on that work, and also have done considerable work in the hydrogenation of oils and secured patents thereon. I have also served as adviser for one packing house that had to do with the manufacture of what is known as compound lard. I have seen hydrogenation processes in operation on the laboratory
432 scale and on the commercial scale. I presume that is sufficient.
Q. 6. Have you delivered any papers germane to this subject?
A. On the refining of oils, yes. I am to give a paper before the Franklin Institute next month upon the hydrogenation of oils.
Q. 7. In addition to your knowledge of the chemistry of the subject, as I understand you your knowledge extends to the present day industry of hydrogenized food products?
A. I think so.
Q. 8. It is stipulated that "Kream Krisp" like the product in the can marked Plaintiff's Exhibit Defendant's product was made by the defendant from cottonseed oil by the addition of hydrogen. Have you e amined some of the product taken from this can to determine whether it is a lard-like food product and if so with what result?
A. I have, and I regard it lard-like and a food product.
Q 9. Have you done anything with it as to a food product?

A. I have used it in my home.

Q. 10. And found in such use that it is a substitute for lard, as I understand you?

A. We used it in that way; in fact we used it as a substitute for "Crisco" and not for lard much.

Q. 11. Have you examined it, the product taken from this can, Plaintiff's Exhibit Defendant's product, to determine whether or not it is homogeneous and if so with what result?

A. I have; it appears homogeneous.

Q. 12. Have you examined it also to determine whether or not it is incompletely hydrogenized, and if so, with what result?

A. I have, and I find it is incompletely hydrogenized.

Q. 13. Will you please explain more fully why you say that it is incompletely hydrogenized?

A. If it is cottonseed oil it should give the Halphen test.
433 It does not give the Halphen test. Presumably therefore it is partially hydrogenzed but that does not tell whether it is not completely hydrogenized. It shows an iodin absorption value which is an indication that it is not completely hydrogenized. This aside from the physical properties.

Q. 14. By physical properties indicating that it is partially hydrogenized, as I understand you, you referred to its lard-like character?

A. The melting point.

Q. 15. The lard-like character and melting point?

A. Yes.

By the Court:

Q. 16. You mean to say that that indicates it is partially hydrogenized?

A. Yes.

Q. 17. The lard-like quality you found and what you ascertained to be the melting point?

A. I can give you the figure by two different samples. The figure by one method approximating forty degrees centigrade; by the other thirty-eight and a half degrees.

By Mr. Gifford:

Q. 18. The last figures given by you are the melting point, as I understand you?

A. Yes.

Q. 19. Will you please produce for the inspection of the Court a hydrogenized cottonseed oil as distinguished from a partially hydrogenized cottonseed oil?

A. This (indicating) is not quite completely hydrogenized, but it is very nearly so.

Mr. Gifford: I offer that in evidence.

Marked Plaintiff's Exhibit 3.

434 By the Court:

Q. 19. Describe this as compared with the incompletely hydrogenized product so that the description can be in the record?

A. This has a melting point of 61, and an iodin absorption number 1.4.

By Mr. Gifford:

Q. 20. Is it lard-like?

A. No, sir.

Q. 21. In what respects is it not lard-like in physical properties?

A. Well, it is not salve-like, it is brittle, it is hard; it is absolutely different in appearance.

Q. 22. Please produce a specimen of cottonseed oil which has not been hydrogenized at all?

A. I produce it.

Mr. Gifford: I offer that in evidence.

Marked Plaintiff's Exhibit 4.

Q. 23. You have referred to the Halphen test. That is a test, as I understand it, for the determination of whether any cottonseed oil exists in a product?

A. It is probably the best test for the detection of cottonseed oil but it is not an absolute final test. For instance, there are other oils which will give that test. Even lard will give that test if the animals have been fed upon cottonseed meal.

Q. 24. But, as I understand it, the Halphen test is a test customarily employed?

A. It is.

Q. 25. Do you know how small a percentage of cottonseed oil it will detect in a product?

A. It will detect at least one per cent.

Q. 26. Please describe this Halphen test?

A. The test depends upon heating a definite amount of the oil with a solution containing sulphur. The solution usually is
435 made up of carbon di-sulphide and amyl alcohol. The conditions may vary in various practices but essentially it is bringing sulphur in contact with the oil.

Mr. Gifford: I will explain to your Honor that the plaintiff's view of this case is that it is not at all complicated and does not necessarily involve any chemical considerations at all. The first and second claims are the only ones in issue. If the balance of the claims of the patent were in issue chemical questions might be brought in, but we do not consider them as germane to the discussion and therefore I rest the direct examination of this witness expressly to avoid bringing in unnecessary and irrelevant matter.

Cross-examination.

By Mr. Pennie:

X Q. 27. In your direct examination you said, as I understood it, that you have more or less acquaintance with the commercial hydrogenation of cottonseed oil; is that so?

A. Yes.

X Q. 28. Have you ever seen in operation the Defendant's process?

A. I have not.

X Q. 29. Have you ever produced the Defendant's product?

A. I produced something pretty close to it. Here is one that shows solid fats 29½; of oleic 40.7 and linolic 29.4. Here is one with the solid 31.4; oleic 34.1 and linolic 34.5.

X Q. 30. Will you please show those to me?

A. Yes; the first one I mentioned was No. 540 and the other one No. 541.

X Q. 31. How did you produce the first of these products?

A. I did not produce them personally, but they were pro-
426 duced by the Kayser process, using the Kayser apparatus.

X Q. 32. Who did produce them?

A. Mr. Morrison, the chief chemist of Procter & Gamble.

X Q. 33. You have no personal knowledge then as to the manner in which these two products which you have produced were actually made?

A. Only in accordance with the report made to me just like I would have a report made to me by an assistant.

X Q. 34. Were you present when these products were made by Mr. Morrison?

A. No; if I had been I should have said I made them; I had participated in making them personally.

Mr. Pennie: The testimony of the witness as to the identity of these products with the Kayser process is objected to as hearsay.

The Court: Are you going to connect it?

Mr. Kerr: The testimony will stand subject to an examination of Mr. Morrison on the subject; he has brought it out.

The Court: Do you propose to corroborate it?

Mr. Kerr: We will now; of course we will.

The Court: I will allow it to stand then subject to being connected.

X Q. 35. Is the first one of these products which you have produced a lard-like product?

A. Yes.

X Q. 36. In what sense?

A. Well, it is lard-like; it looks like lard.

X Q. 37. Is it homogeneous?

A. I think that sample is; that would depend upon subsequent treatment if you were going to work it on a commercial scale.

X Q. 38. What is your understanding of the word,
427 "homogeneous" as used in your testimony?

A. Uniform throughout.

X Q. 39. Do you mean chemically uniform?

A. I would say more physically uniform.

X Q. 40. It is made up of different glycerids, differing from each other chemically?

A. Yes.

X Q. 41. Would you call this material that you have produced in these two specimens a solid or a semi-solid?

A. I would say it was a semi-solid, I suppose.

X Q. 42. What is your definition of a solid as distinguished from a semi-solid?

A. Well, it is dependent really upon temperature. A solid is a non-compressible substance; it is more or less rigid at a definite temperature; if you elevate the temperature that solid can easily become liquid. There are times in between when the substance may become plastic; those are terms. In other words, it is dependent upon temperature.

X Q. 43. Is the specimen Plaintiff's Exhibit 3 which you produced a solid or a semi-solid?

A. It is a solid at this temperature.

X Q. 44. In so far as edibility is concerned does it make any difference whether the material is a semi-solid of the consistency of the two specimens you have referred to as having been made by the Kayser process or if it is of a harder degree of solidity than those specimens?

A. How much harder?

X Q. 45. Let us say halfway between the hardness of this specimen which you have introduced in evidence and the specimen, Plaintiff's Exhibit 3?

A. It would only be an opinion that I could express there, but it would be founded upon the investigations published by Langworthy of the Bureau of Home Economics in which he states that oils and fats of low melting point are more thoroughly digested than
438 those of a higher melting point, and I can cite the reference if you desire.

Mr. Pennie: I would like to have these specimens marked for identification.

Bottle No. 540 is marked Defendant's Exhibit B.
Bottle No. 541 marked Defendant's Exhibit C.

X Q. 46. You need not pause to find the citation to which you have referred. I will ask you whether there is any point between the condition of consistency of the two specimens produced by you and which have now been marked for identification, Defendant's Exhibits B and C at which an oil of the same character would become unedible on its way up to the condition which is represented in Plaintiff's Exhibit No. 3?

A. Not knowing what you mean exactly by "unedible" I would say that I suppose you could eat this (witness bit off a small piece and chewed it).

X Q. 47. That is Plaintiff's Exhibit No. 3?

A. It is very much harder than the others; it would not be par-

icularly pleasant eating nor do I think it would be digested,—that is completely digested.

X Q. 48. I gather from what you just said then, that if cotton-seed oil is hydrogenized up to a certain high degree, of high melting point, in your opinion it would not be an edible product?

A. How high?

X Q. 49. Well, let us say as high as fifty-three degrees centigrade melting point.

A. I should think that would be too high for practical purposes.

X Q. 50. Do you know whether cottonseed oil which has been hydrogenized up to that range is actually used in food products?

A. It is used as a food product being diluted down in mak-
439 ing what they call "compounds."

X Q. 51. So that the mere circumstance that it has been raised to that high melting point does not militate against its use as a food product, is that true?

A. I do not think it militates against its use in food, but alone, is what I understood before, to use it at fifty-four I think would be too high.

X Q. 52. If you mixed the hydrogenized cotton-seed oil of as high melting point as fifty-three degrees centigrade with cottonseed oil so as to make a lard compound that is an edible food product, is it not?

A. Not necessarily.

X Q. 53. It is as a constituent of that lard compound edible and wholesome? Wholesome also?

A. I have no reason to think otherwise, that is provided proper precautions are taken to see that it is purified.

X Q. 54. I am assuming of course that the material, whatever its melting point may be, is properly purified in the ordinary commercial way. With that understanding of the question you have no criticism to make of the edibility of cottonseed oil which is hardened up to fifty-three degrees centigrade, have you? That is fifty-three degrees centigrade melting point.

A. And then when mixed with oil, from what I know now, I have no objection to it; but if it were presented to me as a brand new proposition I would not say so by any means.

X Q. 55. You know, however, that lard compounds in which hydrogenized cottonseed oil of substantially fifty-three degrees centigrade is used, lard compounds in admixture with cottonseed oil and is sold to the extent of hundreds of thousands of pounds throughout the country?

A. Yes, I know that.

440 X Q. 56. Is it your opinion that cottonseed oil that is hydrogenized up to the fifty-three degrees centigrade melting point is as such a shortening agent? Can it be used in shortening operations?

A. What do you mean by "shortening"?

X Q. 57. I used the word "shortening" in the ordinary sense of domestic economy, that is for shortening such materials as bread for instance.

A. My idea about what produces a shortening is either the oil or the low melting fat, it is not the high melting fat.

X Q. 58. You know, do you not that cottonseed oil is used very usually as a shortening in the manufacture of bread?

A. I do not know it.

X Q. 59. You would not be surprised if that were the fact?

A. This is a day of surprises.

X Q. 60. Do you mean to indicate any doubt as to whether cottonseed oil is a suitable shortening in the manufacture of leavened bread by bakers using cottonseed oil alone?

A. Admixed with something else?

X Q. 61. Using cottonseed oil alone as a shortening agent?

A. I am unable to answer that.

X Q. 62. Are you aware that cottonseed oil hardened up to a very high melting point, fifty-three degrees and above is actually used as a shortening by bakers in the manufacture of leavened bread?

A. I only know it by hearsay.

X Q. 63. You know it by hearsay?

A. I have heard that somebody is using it but I do not know anything more about it than that.

X Q. 64. So that in so far as the appropriateness of cottonseed oil hardening up to fifty-three degrees is concerned as a shortening agent, you do not feel able to express an expert opinion, is that true?

A. True.

441 X Q. 65. Have you made determinations of the iodin values of the two specimens which you have produced and which are marked for identification Defendant's Exhibits B and C?

A. I have not personally, no.

X Q. 66. You say you have not personally?

A. No.

X Q. 67. You do not know its iodin value?

A. I do know—the iodin value I think is put on the label.

X Q. 68. Will you please examine the labels and see whether it is on the labels?

A. The iodin value is on 540, that is to say the iodin value is on both of these.

X Q. 69. Will you please read the iodin values that are on these labels?

A. This Exhibit B, the iodin value is 86.6; iodin value of the liquid fatty acids 128.7. Exhibit C the iodin value is 89.2; the iodin value of the liquid fatty acids is 136.2.

The Court: Are both of those the defendant's?

Mr. Pennie: These have been produced by Mr. Baskerville and have been marked merely for identification, and will be introduced by someone else.

The Court: As its product?

Mr. Pennie: No. these are as I understand it produced by Dr. Baskerville with the statement that he understands them to be

products which were produced by the Kayser process and of a composition approximating the defendant's product.

X Q. 70. Plaintiff's Exhibit No. 4 represents cottonseed oil as I understand it?

A. Yes, sir.

442 X Q. 71. What is the iodin value of the specimen which is shown in Plaintiff's Exhibit No. 4?

A. I will have to look up my notes. The iodin value of that oil is 108 and of the liquid fatty acids 147.

X Q. 72. Please state the method by which you arrived at this iodin value?

A. Those determinations were made in the laboratory of Procter & Gamble.

X Q. 73. Not by yourself?

A. Not by myself.

X Q. 74. What are the relative proportions of the constituent glycerids in Plaintiff's Exhibit No. 4?

Mr. Gifford: If your Honor please, I do not know but what in order to draw a distinct line as to what we consider to be relevant in the case, that I will have to object to that question and to any questions on that line, because we do not consider that it makes any difference in this case what are the relative values of the constituent glycerids.

The Court: I will allow it and give you an exception.

Mr. Pennie: I would say in that regard your Honor that the patent itself assumes to say what the constituent glycerids of cotton oil are.

Mr. Gifford: But that is the subject of other claims which are not in issue.

The Court. Yes, I understand your position.

A. Solid fats 23.3, oleic 28.9, linolic 47.8.

X Q. 75. Did you make the determinations of the constituent glycerids which you have given in your last answer?

A. That is calculated from the iodin value. Anyone can 443 do that, it is a simple formula.

X Q. 76. That is a mathematical calculation which you have made?

A. No, but which I can do very easily. Anyone can do it, it is a simple formula.

X Q. 77. Do you know enough about cottonseed oil to be able to say whether there is any cottonseed oil which has a composition of mixed glycerids as follows: 17 per cent. saturated fats, 37 per cent. linolin, and 46 per cent. olein?

A. I should say that is an obvious error.

The Court: What are you reading from, from the patent?

Mr. Pennie: Reading from the patent.

The Court: Where is that?

Mr. Pennie: That is on page 2 of the patent, lines 19 to 21 inclusive.

X Q. 78. The percentage of saturated fats is much higher than seventeen per cent. in cottonseed oil, is it not?

A. The values usually go from twenty to twenty-three; but there may be cases where it would go up and there might be cases where it would go down by certain treatment.

X Q. 79. What is the obvious error that you detect in the supposed combination of glycerids 17 per cent. saturated fat, 37 per cent. linolin and 46 per cent. olein?

A. Reversal of the figures in regard to olein and linolin.

X Q. 80. So that as I understand it in cottonseed oil the olein content instead of being 46 per cent. should be stated as 37 per cent. and the linolin content instead of being stated as 37 per cent. should be stated as 46 per cent., is that correct?

444 A. That is just my opinion. My opinion about it is that is an incorrect statement unless he had some special oil that I am not familiar with.

X Q. 81. You have referred to the Halphen test as a test that can be used for the presence of cottonseed oil. If I were to hand you a specimen of cottonseed oil which did not respond to the Halphen test, would you know whether that oil had been hydrogenated or not?

A. I think I could find out. I would find out by determining the iodin number. If the iodin had not been materially altered, why I would know that probably cottonseed oil had been heated quite hot, probably, to say, 250 degrees, for some length of time when it interferes with the Halphen test.

X Q. 82. That is, if in the commercial treatment of cottonseed oil it is raised to a high temperature, a change takes place in it which destroys the applicability of the Halphen test as an indication of the presence of cottonseed oil in the oil under investigation, is that correct?

A. Correct.

X Q. 83. Well, what is removed by heating oil to such a temperature that it does not respond to the Halphen test reaction?

A. I do not know, it has not been determined what actually responds to the Halphen test.

X Q. 84. Whatever it is, it is of an extremely delicate character as a responsive agent to any test whatever, is that true?

A. I do not know that that is true at all. If it will pass clear through animals which have been fed on cottonseed cake and come out in the fat of the animal, it looks to me like it ought to be fairly stable.

X Q. 85. Have you any opinion then as to what disappears when cotton oil is heated to such a temperature that it will not respond to the Halphen reaction?

445 A. I do not know what the thing is that responds to the Halphen action. I do not know of anybody who does know it.

X Q. 86. Are you able to say what amount of this material that is removed by the high heating of cottonseed oil is present in the oil in its original state?

A. I am unable to say the percentage.

X Q. 87. The percentage is extremely minute, is it not?
A. It must be small.
X Q. 88. It is minute, is it not?
A. It must be small because we can account for a large amount of the constituents of the cottonseed oil and the rest we do not account for, and that must be in that unaccounted for.
X Q. 89. Have you any idea as to the percentage of this material?
A. I do not know that percentage.
X Q. 90. It is very much less than one per cent?
A. I do not know the percentage.
X. Q. 91. Referring to the hard material which you have produced and which has been marked Plaintiff's Exhibit No. 3, you state that it has an iodin value of 1.4. What does this mean?
A. In what way?
X Q. 92. What is the significance of the iodin value 1.4?
A. That this product is nearly saturated.
X Q. 93. It means also, does it not, that it contains unsaturated glycerids?
A. That would be the impression, but very, very small quantities though.
X Q. 94. There is no accounting otherwise for the iodin value of the product, is there?

Mr. Gifford: What product are you referring to now?
Mr. Pennie: Plaintiff's Exhibit No. 3.

446 A. I think that would be a safe conclusion to draw, unless there might be an experimental error, but I doubt it.
X Q. 95. But in hydrogenated products produced from cottonseed oil the iodin value would increase as the product in question was of progressively lower melting point than 61 degrees Centigrade which is the melting point of Plaintiff's Exhibit No. 3, is that correct?
A. Normally so, yes, I should draw that conclusion.
X Q. 96. So that the increasing iodin number as the melting point diminished would be an indication of an increasing amount of unsaturated glycerids that were present in the products examined?
A. Yes.

Redirect examination.

By Mr. Gifford:

R. D. Q. 97. You have been cross examined as to the hydrogenized product and its edibility mixed with cottonseed oil. Did you know of any such thing prior to November 10, 1910?
A. I did not.
R. D. Q. 98. Had you ever heard of any hydrogenized food product, that is a food product that was hydrogenized in whole or in part before that date?
A. No.
R. D. Q. 99. That whole industry as I understand it, so far as your knowledge is concerned has originated since that day?

A. Yes.

R. D. Q. 100. You have said on information and belief that the specimens marked for identification as Defendant's Exhibits B and C were made by the Kayser process, do you mean the Kayser process carried to completion or arrested before complete hydrogenation?

Mr. Pennie: I object to the question as incompetent, the
447 witness being unable to testify at all as to how the specimens were produced.

The Court: I will allow him to state what he knows.

A. I mean that the Kayser process was so regulated as to produce this product.

A. I mean that the Kayser process was so regulated as to produce this product.

R. D. Q. 101. By "so regulated" do you mean that it was stopped at a certain point?

A. I mean that I can describe it exactly if that would clarify things?

R. D. Q. 102. I think it would be better.

A. By taking a certain amount of cottonseed oil that is hydrogenated up to a certain point, then more cottonseed oil added and only hydrogenated slightly, then the whole body has been hydrogenated and the resultant product is the product seen here.

By the Court:

Q. 103. You do not know anything about it?
A. It was carried out according to my instructions.
Q. 104. That is what you told them to do?
A. Yes.

Recross-examination.

By Mr. Pennie:

R. X Q. 105. These instructions that you gave were instructions to carry on the process in the very unusual manner, were they not? There was nothing of that kind described in the Kayser patent?

A. So far as I am aware, no.

By Mr. Gifford:

R. R. D. Q. 106. Your understanding of the manner in which the specimens marked for identification, Defendant's Exhibits B and C, is that they were made in the regular Kayser ap-
448 paratus, is that so?

A. On a laboratory scale.

The Court: What is the product, plaintiff's exhibit whatever the number is that he had reference to and says that you see here?

Mr. Pennie: That is Exhibits B and C for identification.

Mr. Gifford: Since they are not part of the prima facie case I do

not know that it is in order to produce Mr. Morrison now, but we can produce him on rebuttal.

GUY B. TAYLOR, called as a witness on behalf of the plaintiff, being duly sworn, testifies as follows:

Direct examination.

By Mr. Allen:

Q. 1. Your age, Mr. Taylor?
A. Fifty-three.
Q. 2. And your residence?
A. Glendale, Ohio.
Q. 3. That is a suburb of Cincinnati?
A. Yes, just outside.
—. 4. What is your business, Mr. Taylor?
A. I am employed in the Procter and Gamble Company.
Q. 5. In what capacity?
A. My position is general auditor. I have charge of the department of orders, and accounts and statistics.
Q. 6. What is the business of Procter & Gamble Company?
A. Manufacture and sale of soaps and glycerine, cottonseed oil and cooking fats.
Q. 7. Does the Procter & Gamble Company manufacture and sell a cooking fat known as "Crisco"?
A. They do.
449 Q. 8. Have you a sample of the Crisco package here?
A. There is a sample here that I have seen.
Q. 9. That is it?
A. That is it, yes, sir.

Mr. Allen: I offer it in evidence.

Same marked Plaintiff's Exhibit No. 5.

Mr. Pennie: If your Honor please, I understand there will be some effort made to show what this Crisco is so as to identify it with the subject matter of the patent that it is supposed to represent the patent in theory?

The Court: Yes, I think that is so.

Mr. Pennie: I object to it until such showing is made.

The Court: You have got to put in all your evidence now instead of resting on your patent, and it seems to me you ought to connect up in some way and lay some foundation, at least some sort of a foundation instead of putting in some sort of a mutilated rebuttal now.

Mr. Allen: It is not intended as a mutilated rebuttal. I was asking him whether he knew about the keeping of the statistics of the company, the sales of this product, and then I was going to ask him in regard to the Crisco.

The Court: Have you shown that was made under the patent?

Mr. Allen: Not as yet. There are a great many depositions that have been taken. The reason this case comes in a little peculiar

way is because the defendant has taken the depositions of all the plaintiff's officers; and a stipulation has been offered that the
450 testimony can go in in this case notwithstanding some of the witnesses will be here and therefore we have them in the case case now, although the depositions have not been filed under this stipulation.

The Court: Have you offered them?

Mr. Allen: No, we have not.

The Court: Well, you can, so as to prove that this product is made under the patent.

Mr. Pennie: There is nothing in the depositions, if your Honor please, that shows the composition.

The Court: I do not see why you particularly object to this. Of course, they are going to prove it at some time.

Mr. Pennie: I doubt it.

The Court: They will make the attempt to; I mean, they may not succeed. You can not tell about it until the case is decided.

Mr. Pennie: Of course, I have not decided the case; but it has not yet been proved in the case except that a material of that kind has been made and sold by Procter & Gamble, that is this material called Crisco. There has been no proof to show that that is the material corresponding to the patent.

Mr. Allen: I am merely going to ask the witness about the sales of a certain product of The Procter & Gamble Company. I have merely got him now to identify what the product was he was talking about.

The Court: I think you may as well put it in and I will give him an exception if he wants one.

Mr. Allen: It will surely have to be put in before the case is over.

451 Q. 10. Does your department keep statistical records of the sales of this product Crisco?

A. Yes, it does.

Q. 11. When did the Procter & Gamble Company first begin to manufacture and place on the market this product Crisco?

A. The records of the first shipments made came in April 1, 1911, and from then on the records were kept.

Q. 12. When did it first begin to go on the market in any quantities?

A. Well, June.

Q. 13. 1911?

A. June of 1911.

Q. 14. If you have looked up the records of the sales I wish you would give us in round numbers, in pounds, the amount of this Crisco product that was sold during the first six months, say up to the 1st of January, 1912?

A. During that period there were 2,600,000 pounds.

Q. 15. Will you also give us the amount in pounds for each year thereafter of this Crisco?

A. For the year ending December 31, 1912, 14,500,000 pounds. I am giving these in round numbers.

Q. 16. In round numbers, yes.

A. The year ending December 31, 1913, 23,800,900 pounds. The year ending December 31, 1914, 40,000,000 pounds. The year ending December 31, 1915, 47,700,000 pounds; the year ending December 31, 1916, 60,500,000 pounds.

Cross-examination.

By Mr. Pennie:

X Q. 17. Referring to this first period of six months, do you know whether that material was sold or not?
A. No.
X Q. 18. Was not some of it given away?
A. Well, the records that I have given here represent sales.
452 X Q. 19. Do you know to what extent efforts were made to put this material upon the market as a preliminary to these sales?
A. I do not.
X Q. 20. You know nothing about that?
A. I do not.

By the Court:

Q. 21. Does not it appear at all in your books? Have you not some system of accounting for it that you are aware of?
A. Well, if I understand your question, the question was what effort was made to put the material on the market prior to April, 1911?

Mr. Pennie: I think the witness does not understand the question.

A. (Continuing:) Just what do you mean by "effort," please?

By Mr. Pennie:

X Q. 22. Have you any information as to the amount of money spent for advertising this product in various ways before it was put upon the market?
A. I have information as to the amount of money spent for advertising.
X Q. 23. Please state the amount for the year 1911?
A. It was about $180,000.

By the Court:

Q. 24. Not of this product, though, or do you mean this product?
A. I mean for the advertising of Crisco.
Q. 25. Of this product?
A. Yes.

453 By Mr. Pennie:

X Q. 26. And how much money was spent for advertising during the next year, 1912?
A. About $400,000.

X Q. 27. And in 1913?
A. About the same amount.
X Q. 28. And in 1914?
A. The same amount in 1914; the amounts are practically in round figures; they did not vary.
X Q. 29. And in 1915?
A. The same amount in 1915.
X Q. 30. And also in 1916?
A. Also in 1916.

By the Court:

Q. 31. What did you spend for other advertising in your soap business?
A. That I cannot say, I have not the figures.

Mr. Gifford: Can you approximate it to the Court, Mr. Taylor, in answer to his question?

A. (Continuing:) This is for the other products than Crisco, you mean?
Q 32. Yes.
A. Well, I would make it as an approximate statement from my recollection, probably $600,000 or $700,000.
Q. 33. A year?
A. A year.

By Mr. Pennie:

X Q. 34. You mean in your soap business?
A. Yes. I wish to offer that as an approximation, I have not examined those figures, or figures of that sort lately enough to make any really definite statement.
454 X Q. 35. As auditor the details of whatever advertising campaign is carried on for the sale of Crisco come to your attention, do they not, more or less?
A. They come to my attention in the way of costs and figures representing the costs of the advertising.
X Q. 36. Is it not true that as a preliminary to putting Crisco on the market, that every jobbing dealer in the United States to the extent of 3,500 or more was furnished with advertising circulars and that to each was sent full sized samples of the product packed and branded as Crisco?
A. That I cannot say as a positive answer.
X Q. 37. That is substantially true, is it not?
A. That is, I believe substantially true.

By the Court:

Q 38. What is it sold at per pound, approximately when you refer to this sixty millions and a half pounds?
A. That is during the year 1916. During the year 1916 the price varied from 16 to 20 cents per pound, that is the selling price.
X Q. 39. Is it not also true that an extensive campaign of street

car advertising was a part of this advertising campaign and that this was carried on in a dozen or more cities?

A. My understanding is that street car advertising was a part of the advertising methods.

The Court: Of course, I suppose they do that in the same way that Babbitt advertises his soaps and advertises in the cars.

Mr. Pennie: We happen to have, your Honor, a detailed statement of this campaign of advertising under the signature of
455 Mr. Procter, a member of the Procter & Gamble Company, the present plaintiff, in the form of an answer which was interposed by the Procter & Gamble Company and signed by Mr. Procter in a trade mark litigation entitled the Magnolia Cotton Oil Company against Procter & Gamble Company pending at the present time in the District Court of the United States for the Southern District of Ohio, Western Division, in Equity No. 102.

The Court: What are you particularly claiming about this?

Mr. Pennie: I would like to show that these large sales that are referred to of this product "Crisco" were due very largely to the enormous system of campaign advertising which was carried on, which Mr. Procter himself in the testimony taken at Cincinnati said was over $1,000,000 and which the witness here now brings up to still higher figures and it is stated in this answer to be over $3,000,000.

The Court: And not of the superiority over your product, or novelty?

Mr. Pennie: And not on account of any superiority or novelty.

The Court: Of course, it must be a good product or they would not have sold so much of it, and increasing sales in six years.

Mr. Pennie: If you will stop advertising a product of that kind it goes out of the market, like "Force" and other things with which we are familiar.

I want to ask my friends if they will agree that this statement as to the details of this campaign may be accepted in evidence?

456 Mr. Gifford: No; I do not, if your Honor please. They had Mr. Procter on the stand, and the time when they should have produced that was when Mr. Procter was on the stand and had a chance to explain.

Mr. Pennie: At that time we were unaware of it. I will then try to get what I can out of the witness.

X Q. 40. This advertising was by bill and poster, was it not, and also newspaper advertising?

A. I think it was.

X Q. 41. I am informed that in the fall of 1911, full page or two page advertisements were carried in all of the great national weekly and monthly magazines, which periodicals aggregated a circulation of more than sixteen million copies per week or per month, and that this general scheme of advertising and particularly the periodical advertising has been continued in all of these said magazines from 1911 to the present date; is that substantially true?

A. I am not able to answer such particulars.

X Q. 42. I did not ask you to state the details; that is substantially so, is it not?

A. I can say that there has been conducted what has been termed national advertising, meaning advertising in magazines of national circulation, but the extent I am unable to state.

X Q. 43. Well, practically to the extent that I have stated?

A. That I would not undertake to say, that it covers such circulation as you give. The department that I am in would not develop that in such a way.

457 X Q. 44. Are you aware that in the winter of 1911, that Procter & Gamble Company shipped six 1½ pound cans of "Crisco" to each of fifteen thousand retail merchants selected over the entire United States?

A. No; I am not; I cannot say that I am.

X Q. 45. You do not dispute that, do you?

A. I do not dispute it; no.

The Court: He has testified that there has been a very large amount of advertising. What more do you want than that on the advertising argument?

Mr. Pennie: Only to show that it was very judiciously spent so that it reached every person in the United States.

The Court: Certainly to start in with a new product and advertise it with an expenditure of $180,000 the first year and $400,000 other years is a very active campaign. We are not to assume that they did not know how to do it.

X Q. 46. Is it not true that the method of advertising included lectures delivered at domestic science schools such as Pratt Institute in Brooklyn, Columbia University, Lewis Institute of Chicago and others by high class authorities in domestic science?

A. It is my understanding that that method was used; I cannot say whether it was used at the Pratt Intsitute or any of the others.

X Q. 47. Was the cost of this latter advertising by these authorities included in the amounts that you have specified as having been spent in these several years, or did this involve additional payments?

A. All costs of advertising.

458 X Q. 48. All included?

A. Anything that can be classified as advertising, the cost of it is included in those figures.

Mr. Pennie: If your Honor please, I understand that the testimony taken at Cincinnati is now before the Court and we need not introduce it again?

The Court: Have you offered it; has anybody offered it; the witnesses, some of them are here?

Mr. Pennie: The stipulation provides that the testimony shall stand even though one or more of the witnesses may be summoned here for further examination.

The Court: I should think it would be usual to offer the depositions.

Mr. Pennie: I offer in evidence a printed copy of the depositions

taken at Cincinnati in this cause, under order of Judge Manton, dated September 23rd, 1916, and also the depositions taken at Cincinnati at a later date and stipulated into this cause in a suit pending between this plaintiff, the Procter & Gamble Company, and Swift Company.

Marked Defendant's Exhibit D.

The printed testimony likewise contains the depositions of Clarence von Phul and Kathryn J. von Phul taken in this case at Chicago on October 25th, 1916.

It is stipulated by and between counsel that these printed depositions may be accepted in evidence with the same force and effect as the original, subject to correction.

459 HARLEY J. MORRISON, a witness called on behalf of the plaintiff, being duly sworn, testifies as follows:

Direct examination.

By Mr. Gifford:

Q. 1. What is your name, Mr. Morrison?
A. Harley J. Morrison.
Q. 2. Your age?
A. Fifty-one.
Q. 3. Residence?
A. Cincinnati, Ohio.
Q. 4. Occupation?
A. Chemical superintendent of Procter & Gamble Company.
Q. 5. Have you already testified in this case on commission as a witness for the defendant?
A. I have.
Q. 6. How long have you been with Procter & Gamble Company?
A. With the exception of a short interval, since 1887.
Q. 7. Including the whole time during which they started the industry of hydrogenized food products, as I understand you?
A. Yes.
Q. 8. Do you know their product "Crisco"?
A. I do.
Q. 9. And how it is made?
A. I do.
Q. 10. Please state whether or not it is partially hydrogenized?
A. It is partially hydrogenized.
Q. 11. Partially hydrogenized cottonseed oil?
A. Partially hydrogenized cottonseed oil.
Q. 12. Is it a lard-like food product?
A. It is; yes.
Q. 13. It is homogeneous?
A. It is homogeneous.
Q. 14. Is this specimen marked Plaintiff's Exhibit 5 a specimen of it?
A. It is.

Cross-examination.

By Mr. May:

X Q. 15. Mr. Morrison, what is the iodin value of this "Crisco"?
A. That particular lot I would not be able to state. If you
460 want it approximately, or the general run of "Crisco"——
X Q. 16. Yes; state it approximately?
A. About seventy-eight to eighty.
X Q. 17. Have you ascertained the iodin value of the liquid fatty acids of "Crisco"?
A. Frequently.
X Q. 18. What is the average?
A. About 115.
X Q. 19. And from knowing the iodin value of the liquid fatty acids and the iodin value of the "Crisco" fat you are able to determine approximately the proportions of the component glycerids?
A. Yes.
X Q. 20. What do you figure them to be?
A. I would have to figure that out for you; if you wish me to do so I will do it.
X Q. 21. I would like to have you do it?
A. On a "Crisco" having an iodin value of 80, liquid iodin value of 115, I figure the solid or saturated fats to be 27.3; olein acid to be 52.9 and the linolin to be 19.8.
X Q. 22. I understood you to say, however, that the characteristic "Crisco" had an iodin value of 78?
A. 78 to 80 I said.
X Q. 23. And the liquid fatty acids 110?
A. I think I told you 115.
X Q. 24. 110 to 115?
A. Yes.
X Q. 25. And if the "Crisco" showed that it had an iodin value of 78 and an iodin value of the liquid fatty acids of 110 it would have the component glycerids in approximately the proportions 28 per cent. saturated fats; 52.4 olein and 19.6 linolin?
A. I will have to figure that again I cannot form that just from memory.
X Q. 26. Well, I will ask you to verify those last figures, Mr. Morrison; a "Crisco" having an iodin value of 78 and the
461 iodin value of the liquid fatty acids being 110 so that we may be informed as to the proportions of the component glycerids in the "Crisco"?
A. I get solid 26; olein 57.8 and linolin 16.2.
X Q. 27. By solid you mean saturated fats?
A. Yes; saturated fats.

By the Court:

X Q. 28. What do you mean by saturated fats?
A. They have taken up all the hydrogen that they are capable of.

By Mr. May:

X Q. 29. And the saturated fats are those which have no iodin number, and that indicates that as a matter of fact they can take up no more hydrogen?

A. That is correct; yes.

X Q. 30. And the unsaturated fats of glycerids are those which can take on more hydrogen for the reason that they are unsaturated?

A. That is correct.

X Q. 31. And they are converted by the addition of hydrogen from an unsaturated condition to a saturated condition?

A. Not necessarily from an unsaturated condition to a higher degree—the final product would be a saturated product.

X Q. 32. You were asked if this "Crisco" which you have produced is lard-like; why do you say that it is lard-like?

A. I am familiar with the appearance of lard, and I think in this case this has the same appearance and would appeal to anybody.

X Q. 33. And because it has the same appearance as lard you say it is lard-like?

A. Yes.

462 X Q. 34. And this is the only consideration, is it?

A. The consistency of it goes with that, of course; I mean the physical consistency.

X Q. 35. But you base your statement principally upon the fact that it looks like lard and therefore is lard-like?

A. It looks like lard and it feels like lard to the touch.

X Q. 36. What is the melting point of this "Crisco"?

A. I do not know; I did not determine that.

Mr. May: In view of the answers of the witness we renew our objection to the introduction of this material as the product of the patent in suit.

Objection overruled. Exception.

Mr. May: The fact is, if your Honor please, the specification and file wrapper and contents of the patent in suit refer to a very definite product—that it must be produced by the process as defined in the patent, and it is upon that statement, upon the history of the patent, that we object to the introduction of this material, because we say that it does not respond to the tests of identity which are set forth in the patent.

The Court: You say there is no such disclosure in the patent?

Mr. May: We say that this is not within the disclosure of the patent; it does not correspond to the identification tests of the patent.

Redirect examination.

By Mr. Gifford:

R. D. Q. 37. "Crisco" is used for practically every purpose that lard is used for, is it not?

463 A. I use it in my household that way, and I have had others tell me the same thing.

R. D. Q. 38. In taking the iodin value at 78, and the iodin value for the liquids at 110, do those values exist in any one specimen of "Crisco"?

A. I do not know that I have the specimen now; I have had analyses made that had those characteristic values.

Recross-examination.

By Mr. May:

R. X Q. 39. Have you ever used any lard compound in your family?

A. I have; cotton oil.

R. X Q. 40. Have you ever used any "cottolene" or materials of that kind?

A. I never used any "cottolene," no.

R. X Q. 41. Have you ever used lard compounds which were made of animal oleo-stearin and cottonseed oil?

A. I have never had any of those.

R. X Q. 42. Do you know that they are widely used as lard?

A. They are widely used, yes.

Prima facie proofs closed.

Defendant's Proofs.

Mr. Pennie: Defendant offers in evidence a certified copy of the file wrapper and contents in the matter of Letters Patent No. 1,135,351 to John J. Burchenal assignor to the Proctor & Gamble Company for improvements in food products, the same being the patent in suit.

Marked Defendant's Exhibit E.

Defendant also offers in evidence printed copy of the specification and drawings of patent to Edward C. Kayser No. 1,004,435 dated September 26th, 1911.

464 Also printed copy of the specification and drawings of United States patent to Edward C. Kayser No. 1,008,474 dated November 14th, 1911.

Also a photostat copy of the specification of the German patent No. 141,029 dated August 14th, 1902, to Herforder Maschinenfett und Oele Fabrik Le Prince & Siveke together with a translation thereof.

Also a printed copy of the specifications of British patent No. 1,515 of the year 1903 to Wilhelm Normann.

Also a printed copy of the specification of British patent No. 2,520 of the year 1907 to Fred Bedford & Charles Edward Williams.

Defendant's counsel also offers in evidence a photostat copy of a printed publication entitled Zeitschrift für Elektrachemie, published at Halle, Germany, Vol. 12 (Year 1906), pages 749 to 762, inclusive, together with a translation thereof.

Defendant's Counsel also offers in evidence a photostat copy of a Russian publication appearing in the Russian Physical-Chemical Society (published in the Russian language, at St. Petersburg, Russia) Vol. 38 (Year 1906), pages 419 to 446, inclusive, and pages 855 to 856, inclusive; Vol. 39 (Year 1907), pages 607 to 609, inclusive; and Vol. 40 (Year 1908), pages 304 to 321, inclusive; together with translations of said publications.

Defendants's Counsel also offers in evidence a photostat copy of a German publication entitled "Berichte der Deutchen Chemischen Gesellschaft," published at Berlin, German-, Vol. 41 (Year 1908), pages 2282 to 2291 inclusive; and Vol. 42 (Year 1909), pages
465 1541 to 1553, inclusive; together with translations of said publications.

Defendant's Counsel also offers in evidence photostat copy of printed German publication entitled "Zeitschrift für Angewandte Chemie und Zentrallblatt" fur technische Chemie, published at Leipzig, Germany, Vol. 22 (Year 1908), pages 1496 to 1502, inclusive; together with translation of said publication.

The foregoing publications are offered as anticipations.

Marked Defendant's Exhibit F.

Mr. Kerr: Of course, those translations are subject to correction of error.

The Court: Yes.

Mr. Pennie: These translations have been in the possession of Counsel for a year or so.

Mr. Kerr: That still does not cut us off from making any suggestions as to corrections.

Mr. Pennie: No.

Counsel for the Defendant also offers in evidence copies of the specifications and drawings of the following United States patents cited in the file wrapper and contents of the letters patent in suit, as showing the state of the art, to wit:

U. S. Patent to Jacob E. Bloom, No. 782,820.
U. S. Patent to Carleton Ellis, No. 1,038,545.
Also U. S. Patent to John J. Burchenal, 1,135,935.
Also U. S. Patent to Philip Schwoerer, No. 902,177.

466 Those are all contained in Exhibit F.

Counsel for the Defendant also offers in evidence a photostat copy of German patent to Erdman, No. 211,669, cited in the file wrapper of the patent in suit, and also a translation of said patent, as part of the prior state of the art.

The Court: Are those all cited in the file wrapper?

Mr. Pennie: All of those are cited.

The Court: From Bloom to Erdmann inclusive?

Mr. Pennie: Yes, sir; and they are in the binder Exhibit F.

Counsel for the defendant also offers in evidence certified copies of the file wrapper and contents of the aforesaid Kayser patents, Nos. 1,004,035 and 1,008,474.

Marked Defendant's Exhibits G and H.

Recess.

After Recess.

WILLIAM H. WALKER, a witness called on behalf of the defendant, being first duly sworn, testified as follows:

Direct examination.

By Mr. Pennie:

Q. 1. What is your name?
A. William H. Walker.
Q. 2. And your age?
A. 48.
Q. 3. Your residence
A. Boston, Massachusetts.
Q. 4. Your occupation?
467 A. I am by profession a teacher. I am Professor of Chemical Engineering at the Massachusetts Institute of Technology, and Director of the Research Laboratory of Applied Chemistry at that Institution.

Q. 5. For how many years have you been connected with the Institution as a teacher or instructor and in what capacities?

A. I entered the Institute in 1894 as instructor in chemistry and with the exception of three years when I was connected with a commercial organization, I have been there ever since. Since 1903, I have been professor of Chemical Engineering.

Q. 6. Are you acquainted with the apparatus and processes by the Berlin Mills Company for the manufacture of its products called Kream Krisp which has been referred to in the taking of these depositions?

A. I am.

The Court: Has his deposition been taken?
Mr. Pennie: His deposition has not been taken, sir.

Q. 7. What material is used as the starting point for the manufacture of that product?

A. Cotton seed oil, which is a mixture of the glycerides or esters of the fatty acids.

Q. 8. What are the main constituent glycerides entering into the mixture?

A. They are linolin, olein and the two solid or saturated glycerids, stearin and palmitin, those two are usually spoken of together as stearin.

The Court: That is the solid?

Mr. Pennie: That is the cotton oil which is the starting material.

468 The Court: But the solid material is called stearin?

Mr. Pennie: It is called stearin but is in fact, as the doctor says, stearin and palmitin together.

Q. 9. Which have the higher melting point, the saturated glycerides or unsaturated?

A. The saturated glycerides melt higher than the unsaturated glycerides.

Q. 10. How is this reflected in the consistency of the cotton-seed oil?

A. The fact that cotton-seed oil contains a relatively large amount of the unsaturated glycerides which are liquids and a relatively small amount of the saturated glycerids, the solids, results in the fact that the oil itself is a liquid.

Q. 11. And to what circumstance is due semi-solid condition of Kream Krisp, the defendant's product?

A. The relative proportions of these three ingredients has been changed so that we have in Kream Krisp a larger proportion of the saturated or solid glycerids and a corresponding small proportion of the unsaturated.

Q. 12. What are mixtures of glycerids of such low melting point that they will remain liquid in ordinary temperatures called?

A. They are called oils.

Q. 13. And what are those mixtures of glycerids which have such a melting point that they are solid or semi-solid in ordinary temperatures called?

A. We call those fats.

Q. 14. Are there any other differences between these mixtures other than that their melting points differ?

A. They differ in proportion of these three glycerids which we have already spoken of.

Q. 15. How does it happen that cotton-seed oil is liquid
469 at ordinary temperatures?

A. Because the proportion of the liquid glycerids is large, while the proportion of the solid glycerids is small. The liquid glycerides dissolve the solid glycerides and reduce therefore a solution of the solid or a liquid.

Q. 16. Will cotton-seed oil remain liquid at low temperatures?

A. No, as you reduce the temperature the solid glycerids separate or crystalize out.

Q. 17. Is any use made of this circumstance in the commercial handling of cotton-seed oil?

A. Yes. When you wish to produce a cotton-seed oil which will remain liquid in Winter time or in cold weather and which we can use as salad oil, for example, we remove a large proportion of the solid glycerids, stearin, by cooling or chilling the oil. When the stearin has crystalized out, we separate it by filtration from the remaining liquid mass. This gives an oil which remains clear even if the temperature be quite materially reduced.

Q. 18. That is to say, as I understand it, after the cotton seed

oil has been lowered to a certain temperature, the stearin may be separated out by crystalization and filtration in part, and the remaining liquid portion is then available for use as a salad oil that will not give up any portion of the stearin at Winter temperatures; is that correct?

A. That is correct.

Q. 19. For what other purposes is cotton-seed oil employed, whether thus converted into Winter oil or whether left in its original condition?

A. It is used in a number of forms for a food product. In a very much cruder shape as a soap stock, somewhat for lubrication and for some other purposes.

Q. 20. Is it used in cooking?

A. To a very large extent.

Q. 21. What is Summer oil?

A. Summer oil is cotton-seed oil as pressed from the seeds,
470 refined so as to be p-latable and from which none of the normal stearin has been separated in the manner just described.

Q. 22. Is that likewise used as a salad oil?

A. It is.

Q. 23. And for the other purposes described in your preceding answer?

A. It is.

Q. 24. From a chemical standpoint how do these constituent glycerids of cotton-seed oil, that is to say, the saturated constituents and the unsaturated constituents differ from each other?

A. They differ in the condition of the attractive forces which hold the elements of which these constituents are made up together, or as we usually put it, their bondage or linkage.

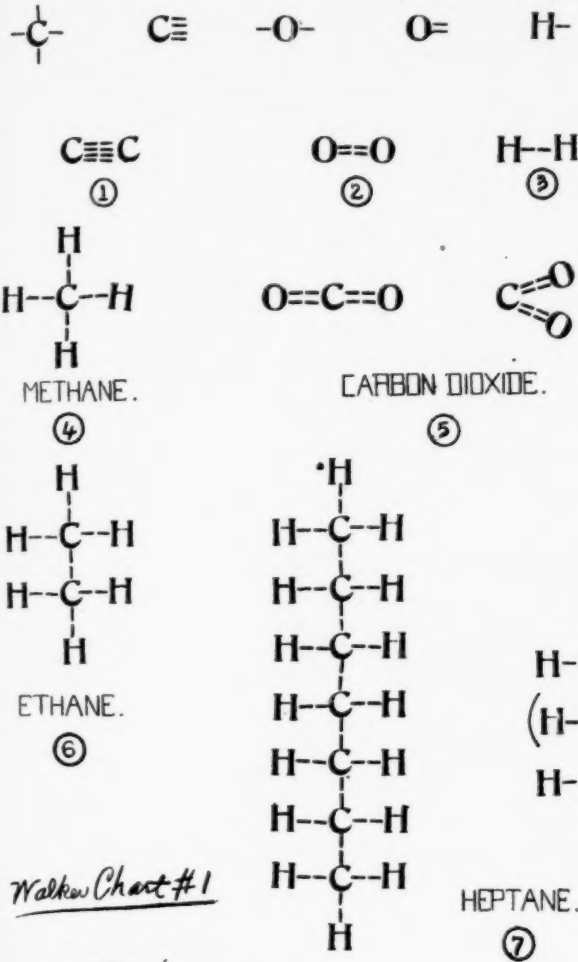
Mr. Pennie: Your Honor will recall that in the patent it is said on page 1 of the patent that "oxydation weakens the fat at the point of absorption at the double bonds," and I wish to elicit from this witness some information in regard to that chemical phenomenon.

Q. 25. What are the individual chemical elements of a glycerid?

A. They are carbon, oxygen and hydrogen.

Q. 26. You have spoken of these elements as bonded or linked together. Will you please more fully describe what you mean as to bonding together of carbon, hydrogen and oxygen in a composition of a glycerid and particularly what is meant by the bonding together of these elements in the glycerids of cotton-seed oil, and also in defendant's product which, according to the stipulation entered in this case, consists of cotton-seed oil to which hydrogen has been added?

(Here follows diagram marked 470½.)



Walker Chart #1

344
Procter & Gamble Co. v Berlin Mills
} $\frac{1}{2}$ 470

471 Mr. Pennie: If your Honor please, may I ask if you will permit the witness to leave the stand so that he may refer to these charts.

The Court: Yes.

A. The three glycerids which are present in cotton-seed oil, are as we have already stated called stearin, olein and linolin and their composition as given in formulas 20–A, 21–A and 22–A would at first sight be very complete and the reaction by which they would be produced appear to be very difficult to understand; but as a matter of fact if we may develop these combinations from their elements, we will find that they are inter-related quite simply and the reactions involved are not difficult to understand.

The three elements with which we are concerned are carbon, which we note as C, oxygen O, and hydrogen H. Now, these elements are held in combination by molecular attractions which we speak of as bonds or linkages, and which we denote by these dashes or straight lines, as shown on Chart 1.

It will help us very much to understand the nature of these compounds, if we can have a mental picture of what is taking place, and if we draw on our imagination we can represent these attractions by hands which are reaching out towards other atoms, ready to grasp some other atom. That is, of course, purely imaginative. From this point of view hydrogen has one arm reaching out one hand that is anxious to clasp its hand with something else, and if it has nothing that is more directly attractive will catch hands with another atom of hydrogen. That is represented in formula 3. I will give

472 this line of charts numbers so as to refer to them in the record. We call formula 3 a molecule of hydrogen. After these two hydrogen atoms have clasped hands in this way they are very relatively, difficult to separate; that is, it requires energy, it requires work to unclasp them again.

In the same way oxygen has two of these hands reaching out. And we can represent them reaching out on both sides of the atom or on the same side, because direction here has no significance. There are some compounds in which the spacing of the atoms is important, but it does not come into any of our compound and therefore we will not consider it.

The direction of these bonds therefore is immaterial.

Now, oxygen having two arms reaching out can grasp two atoms of hydrogen, which will give us this H_2O which is the formula for water (Chart 1, Formula 2). In the same way carbon has four arms reaching out; obviously then carbon can unite with four atoms of hydrogen which we have represented here together in formula 4 and we have the gas methane. This is a common constituent in ordinary natural gas.

In the same way carbon can unite with two oxygen atoms giving us carbon dioxide or carbonic gas (Formula 5) with which we are familiar in soda water. These hands can be either from opposite sides of the molecule or on the same side as representing attraction, as the direction is not significant.

Now, carbon is unique in that it can to any extent unite with itself. That is, instead of this hand reaching out and catching one hydrogen atom, as in Formula 4, it can clasp hands with an-
473 other carbon and then they can combine; and I here represent another formula, No. 6, in which the carbons join hands and unite themselves together. That gives us a molecule which we call ethane which is a gas molecule of illuminating gas. We can continue this down as we see, to a very great extent. Here in Formula 7 we have carbon in each of them here. I think there are seven. That gives us heptone,—a "hydrocarbon" as we say, that is, hydrogen and carbon which is a compound occurring in common gasolene. Now, we can write this formula in order to save space in the way shown on the right of Formula 7. There are a number of the CH_2 groups which are just alike, and we can combine them and put in a parenthesis and put at the end of the parenthesis, this figure or exponent which represents that number. So that this group involves a compound of the common gasoline which can be written right here, and we can put down this formula in this shape—referring to figure 7.

Now, carbon has another peculiarity in that, instead of joining hands with but one of its own atoms or with one of its hands, it can drop two of its atoms of hydrogen, and these two arms then can clasp hands and that gives us a molecule in which we have two hands from one carbon clasping two hands on the other carbon as in Formula 9. Of course, that leaves us only two hands for the hydrogen and we can write this formula this way as in Formula 9 and that gives us a molecule which we call "ethylene," which also occurs in illuminating gas.

The kind of a bond in Formula No. 8 we call a single bond. This one in No. 9 is a double bond. It is interesting to note that these two hands of carbon do not grasp these two with equal vigor,
474 if we may use that expression. One of these holds on tighter than the other does.

We can show that these two bonds which unite the carbon atoms are not of equal strength, by bringing into contact with this gas some of the element iodin.

By the Court:

Q. 26*a*. What two bonds are not of equal strength?

A. These two bonds that join these two carbons together in Formula 9. We know that because when we bring iodin in contact with this gas, the iodin would rather clasp hands with the carbon than with itself so that it separates these two bonds, as I have indicated here between the carbon at the right of Formula 9; they spread out, and the iodin separates, and the iodin clasps hands with this bond and gives us a molecule of this kind shown at the extreme right of Formula 9, to wit, ethylene iodide. This is important because it is this reaction which is the basis for the "iodin number" of which we will have a great deal to say.

Another interesting thing about this double bond of this character is that when we have a large molecule as we had in Formula 7, Chart

Exhibit
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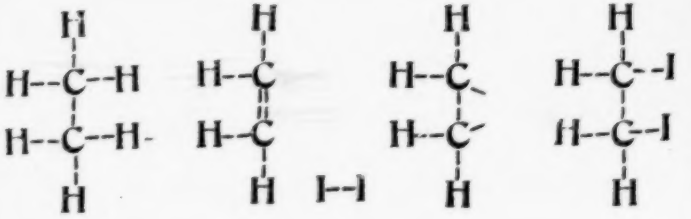
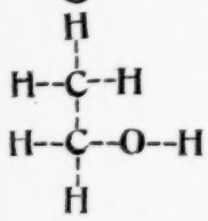


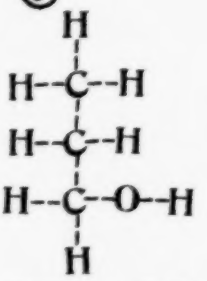
ETHANE. ETHYLENE

(8)

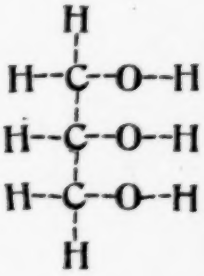


ALCOHOL.

(9)

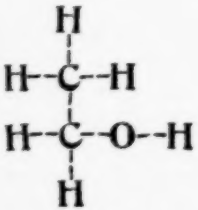


PROPYL ALCOHOL



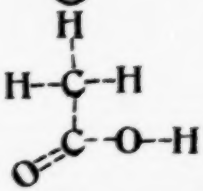
GLYCERINE.

(10)



ALCOHOL.

(11)



(12)

$HOOCCH_3$

$O_2C_2H_4$

ACETIC ACID.

(13)

Walker Chart #2

(14)

1, we can have two of these double bonds in the one molecule and the relative strength of the linkage is controlled, or is varied by the influence of other atoms with which it is surrounded. I mention that because we will come to a case of that kind in linolin.

Now, if we take this grouping shown in Formula 8, and instead of having one of these carbons grasp merely one atom of hydrogen,
475 if instead it grasps an oxygen atom, we have a different molecule which is "alcohol," Formula 10. This is the ordinary alcohol of commerce which we usually speak of as grain alcohol which is usually made by the fermentation and distillation of grain.

Now, we can build up a group from the hydrocarbon chains as we did with the other batch, and therefore in this one (Formula 11) we can have what we know as "propyl alcohol" in which, as it happens, we are not particularly interested. But in this molecule if we bring in this oxygen between the hydrogen and the carbon, in each one of these carbons, we get a formula of this character, No. 12, which is the familiar material "gylcerine" and we speak of that as a tri-atomic alcohol because one molecule of it has three of these OH groups. It is a saturated molecule inasmuch as there are present none of these double bonds. It is these double bonds which we speak of as unsaturated because they will take other things like iodin and as we will show later, under certain circumstances, hydrogen.

Now, taking again our alcohol which we have represented in Formula 13, we can replace two of these hydrogen atoms by an oxygen atom as we have shown in Formula 14. This gives us an acid, and this particular one is acetic acid. That is brought about by displacing two hydrogen atoms from the alcohol and having those two bonds which hold the hydrogen now hold on to one oxygen which you will recall has two hands and gives us this grouping COOH.

Now, this acetic acid can be written in this form in a very much shorter way; $HOOCCH_3$, or the elements can be added together and we get the two carbons, C2, hydrogen 4 and oxygen 2 ($C_2 H_4 O_2$).
476 This group now we call the acid group COOH and we can derive alcohols and acids from all of these large hydrocarbon chains.

We are not interested in any of the acids which can be derived from those long hydrocarbon chains until we come to one with 18 carbons. I have contracted the Formula No. 15 by placing at the top three of the CH^2 groups (and at the bottom seven more) so that the total will add up to 18.

Now, that is a saturated acid because there are no double bonds and it is stearic acid. If we cut out one of these CH^2 groups and join the carbon together we will have palmitic acid. That is the reason why we combine palmitic acid and stearic acid together because they are so near alike, one differing from the other only in having two less CH^2 groups.

Now, if instead of having this chain of 18 carbons united by single bonds we take out two hydrogens and unite two of the carbons by a double bond, we have a different acid, the one shown in Formula

16, and that is oleic acid. That is not much of a change so far as the molecular constitution is concerned,—just dropping two hydrogens, the formula when added up differs by only two hydrogens, the former being $O^2C^{18}H^{36}$, and the latter two oxygens, 18 carbons and 34 hydrogens $O^2C^{18}H^{34}$. These two marks on the top of the C Formula 16, indicate that in this chain of 18 carbons there is one double bond, but that change produces a profound difference in the physical character of the material. The stearic acid Formula 15 is a solid, white, crystaline mass; while by simply by taking out the two hydrogen atoms and giving us a double bond we convert acid into a liquid which is oleic acid (Formula 16).

(Here follows diagram marked page 476½.)

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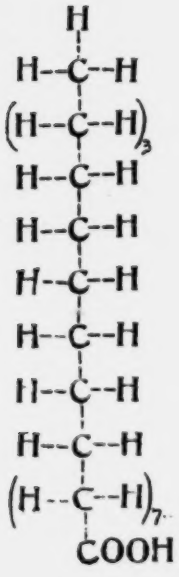
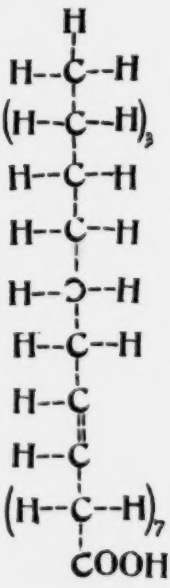


$O_2 C_{18} H_{36}$
STEARIC ACID.

(15)

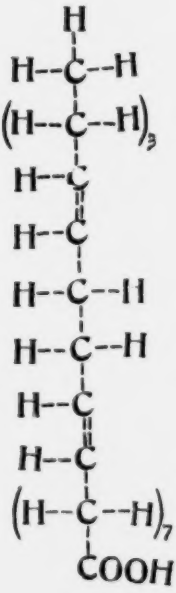
$HOOCC_{17} H_{35}$



$O_2 C_{18} H_{34}$
OLEIC ACID.

(16)

$HOOCC_{17} H_{33}$



$O_2 C_{18} H_{32}$
LINOLIC ACID.

(17)

$HOOCC_{17} H_{31}$

Walker Chart #3

477 Q. 27. You mean by a double bond then two of these atoms that will unite with each other because they have not anything else to unite with?

A. Yes; or, we put it a little different. Here we have two carbons united by a single bond and these hands reaching out and clasping the hydrogen. Now, if by some means we can pull these two hydrogens away we will have two hands clasping together. They will come together and take hands themselves so that each carbon has two hands reaching up, and we will have two hand-clasps, as it were, and the carbon will be held together by two bonds instead of one.

Now, conversely, of course, if we can divide that double bond and put those two hydrogens back again we can change our oleic acid back into stearic acid again. Now, if instead of having but one double bond in oleic acid——

Q. 28. And you could do it by adding hydrogen?

A. You could do it by adding hydrogen, and we do it that way, although not as simply as this would appear to indicate. Now, oleic acid has the composition as shown in Formula 16; if now we introduce into oleic acid another of these double bonds, namely, by taking out two more hydrogens, and let these hands of the carbons come together and clasp, we get a compound which has two double bonds and which is linolic acid, Formula 17, the other acid with which we are concerned.

Now, it is interesting that although those two double bonds look just alike, one is held together somewhat harder, tighter than the other; just which one it is we can not tell.

Oleic acid therefore differs from stearic inhaving two less hydrogens and one double bond, and linolic differs from stearic in having four less hydrogens and two double bonds. We can contract
478 these formulæ, and express them as shown at the bottom of the chart 3 in these forms; stearic acid—HOOC, C 17, H 35,—which is the same as this formula, simply opening it out a litle bit, and oleic acid has the same formula but two hydrogens less, and linolic acid the same with two less than the oleic. I call attention to that because we will see them in that form in order to indicate the next reaction.

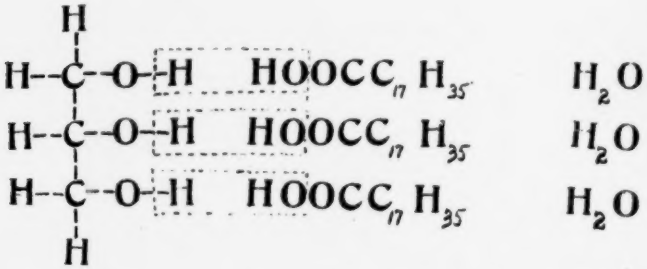
Now, if we take a molecule of glycerin (Formula 18) which you remember is this tri-atomic alcohol, not noticing now the dotted lines, at all, and three molecules of one of these acids, this particular one being three molecules of stearic acid, we can withdraw from them three molecules of water; that is H and O make H20 in each case as indicated by dotted lines. This allows each acid molecule to combine with one carbon of the glycerine; that is, this hand just reaching out, intsead of grasping the hydrogen will grasp over to the carbon, and we get the acid groups joined on to the glycerine group at those three places. That gives us three molecules of water; see Formulas 18 and 19.

Now, right in that, after it has joined together this way, here we have our glycerin as before, and the water has been extracted and the three acid groups have joined on to the three OH's of the

glycerin, and that gives us the fat itself, the stearin (Formula 21), so that stearin is a combination of the three molecules of stearic acid and one molecule of glycerin.

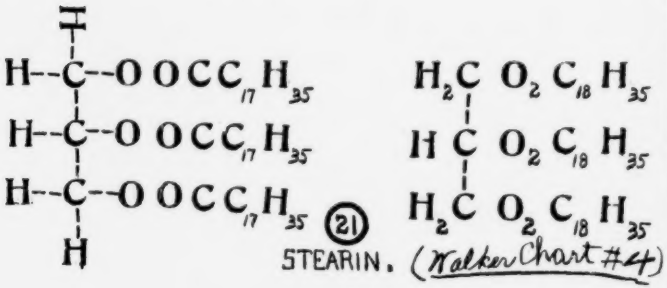
Now, before leaving that I would like to point out that this reaction can reverse itself; that we can start with this fat, the stearin, and by putting back these three molecules of water we can sepa-

(Here follow diagrams marked pages 478½ and 479.)



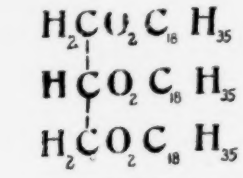
GLYCERIN. STEARIC ACID. WATER.

(18) (19) (20)



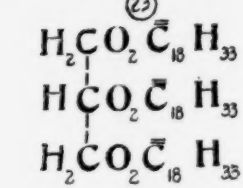
(21) STEARIN. (Walker Chart #4)

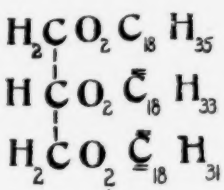
433
Berlin Mills Co
v.
Procter & Gamble Co. } ⊕ 478 1/2



STEARIN.

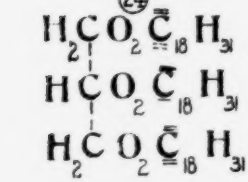
(23)

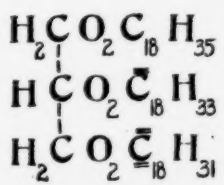




OLEIN.

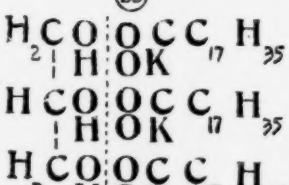
(24)





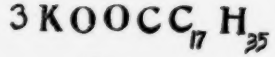
LINOLIN.

(25)



MIXED GLYCERIDES.

(26)



Soap

(27) (Walker Chart #5) (28)

433

Berlin Mill

v

Procter & Gamble Co } 479

479½ rate it into fatty acid, and glycerine, or hydralize it, as we say. That is important because that is the action which takes place in the animal organism when fats are digested. Before anything happens to a fat, so far as digestion is concerned, it is first hydralized; that is, the fat is first broken up into the free fatty acids of which it is composed, and the molecule glycerine, when it is joined in this way, by putting one molecule of water back into the combination which allows it to split into glycerine and free fatty acids.

This formula 21 is the same as we have here, stearin, only contracted.

Now, I have here represented by formula 23, a molecule of stearin which is a glycerine molecule with the three molecules of stearic acid. Here I have in Formula 24 a molecule of olein which again is glycerin and three molecules of oleic acid, together,—showing the double bonds. Here (Formula 25) is a molecule of linolin and again we have glycerin but with three molecules of linolic acid and with two double bonds.

Now, it is obvious that I might a swell combine these in some other way; that is, instead of having three molecules of the same acids united to one glycerine molecule which gives us three molecules of a simple glycerid, and a mixture of those three would be a mixture of simple glycerids; or I can have with my glycerine one molecule of stearic, one of oleic and one of linolic acid, and that then would give us three molecues, each one containing three different acids (see Formula 26). In other words, while the first molecule would be called a simple glycerid because it has only one kind of acid united to glycerine, the second would be called a mixed
480 glycerid because it has different acids united to the same glycerine.

Now, in nature we have both kinds, but we will consider in our fats, that they are all combined as simple glycerids even though we know that in some cases we have mixed glycerids. We do that for two reasons; first because there is analytically no method by which we can determine how the glycerine is combined with the different acids. We have a method of determining the percentage of the stearic olein, and linolin in an oil or fat, if we assume that they are combined in this way as simple glycerids; that is we have an analytical method which will give the percentage composition of an oil or fat in terms of its stearin, olein and linolin. If we consider them as mixed glycerids we have no analytical method of determining their relative proportions in an oil or fat.

The second reason is that from a digestion standpoint the first thing that happens, as we have already seen, is that these molecules are hydralized; that is water enters and the acids are freed.

When once separated from the glycerine, it is of course immaterial how they were combined because then they are not now combined at all. In other words, they are all mixed up, for the moment that they separate from the glycerine, so far as digestion is concerned it is absolutely immaterial whether they were combined of three acid molecules of one kind, with one glycerine, or whether different types of molecules were combined to one glycerine.

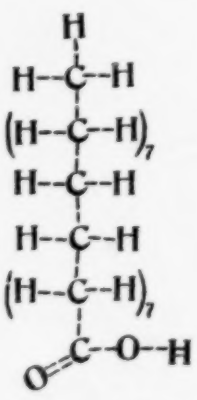
Now, if we take a molecule of any one of these glycerids, and add caustic potash, which we represent by KOH, in formula 27 we get a splitting in this form much like the one with water; that is,
481 if this K was a hydrogen you see we would have the same splitting up as we had above where we have added water to a molecule of stearine; here we are adding potassium with an oxygen and that gives us a molecule of glycerine as before, and three molecules of, in this case, stearic acid, united with potassium instead of hydrogen. Now, that is a soap (formula 28). This is what we speak of as a potash soap. It is a stearic acid soap in which the hydrogen and the stearic acid has been replaced by potassium; it makes a soft soap. If we had that replaced, the potassium atoms by the elements of sodium, it would be a hard soap. This is interesting because this refers to the saponification and is the basis for the saponification number which we will come to in dealing with these facts.

I might finish with the "saponification number." The saponification number which we use when dealing with fats is the number of milligrams of potassium hydrate which is required to unite with one gram or a thousand milligrams of the fat. In other words, it is the number of unit parts by weight of the potassium hydrate which is required to unite with one thousand unit parts by weight of the fat. Most fats have a saponification number of 195; between 193 and 196.

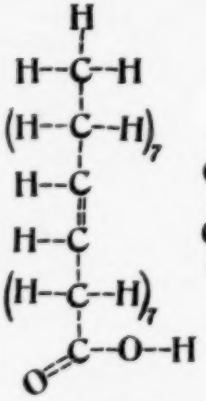
Now, as to the "iodin number," we come back to the ability of the element iodin to break open these double bonds. Here on chart 6 we have oleic acid, and I have shown it in this way to show what appears to be also a double bond between the oxygen and the carbon. Now, while that is the same shape of the double bond as we have between the carbons in the chain it acts in an entirely different way and so far as saturation is concerned we can forget all about it, because it cannot be broken; it holds tight and remains right
482 through the molecule in that form. When now we bring iodin into the presence of a compound having one of these double bonds between two carbons this action takes place, to wit, the iodin splits the double bond and takes its own place in the molecule giving us then a single bond between the carbon with the two iodin atoms taking their place as indicated by formula 29. The "iodin number" now is the number of grams of iodin which is necessary to fill in all the double bonds in 100 grams of the fat. As is seen, each one of these double bonds will take two iodine atoms; therefore by knowing the molecular weight of the fats, and the weight of the iodin which is required to saturate 100 grams of the fat, we can arrive at the "iodin number" of the fat. For example, this oleic acid has an iodin number of 90, I think, which means that it requires 90 grams of iodin to saturate the double bonds in 100 grams of oleic acid. Cottonseed oil is a mixture of linolin, olein and stearin and has an iodin number of about 108 to 110.

Now, if we want to go from oleic acid, or olein up to stearin, we must replace the double bond, that is, open it up and replace it with

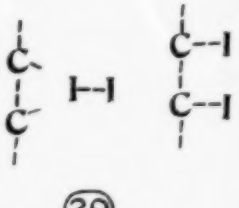
Berlin Mills
v.
Procter & Gamble Co. } ⊘ 482 1/2.



STEARIC ACID.



OLEIC ACID.



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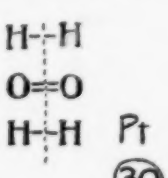

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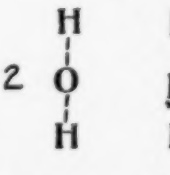


31

Walker Chart #6

hydrogen; but if you bring molecular hydrogen alone into contact with a molecule of that kind it cannot replace the double bond. The hydrogen holds onto itself tighter than it wants to do with the carbon. If we could separate the hydrogen into these two parts H-H so that these hands stick out, reaching to something, then they could break the double bonds and enter the doubl bond of the unsaturated glyceride, but that is not possible with molecular hydrogen alone.

(Here follows diagram marked page 482½.)

Now, it has been known for a long time that hydrogen
483 and that oxygen exist together without any tendency to re-
action. The English physicist Faraday, discovered a long time ago that if you pass a mixture of hydrogen gas and oxygen gas over metallic platinum that it had a very peculiar and distinctly wonderful property of spreading those molecules, as the dotted line indicates in formula 30, and giving us two molecules of water $2H_2O$. That is, the platinum has the ability to disrupt this hand clasp of the hydrogens, to open the molecule up into separate atoms, and also the oxygen, so that they unite together and form water as is shown in this Fig. 30. This type of reaction, namely, one in which a material takes an active part in bringing about the reaction without itself apparently entering into the reaction, is called "catalytic action" and the material, in this case platinum, is called a catalyst. Such reactions are now common in industrial chemistry and are very important. Some of our most important reactions will not proceed except for the presence of material to make them go but which itself is not acted upon, namely, the catalyst. Faraday discovered further that a catalyst was in some respects, like a living organism; it may, for example, be easily poisoned by such chemicals as poison a living organism.

Now, two Frenchmen, Sabatier and Senderens, many years later discovered that metallic nickel when prepared so that it would be physically finely divided would act much as platinum does and will bring about a reaction between the double bonds of carbon and hydrogen. Thus in Formula 31, if we pass a mixture of ethylene and
hydrogen over finely divided nickel, the nickel has the ability
484 to split up the hydrogen and to make it unite with this double
bond of the ethylene and give us again the hydrocarbon ethane which is saturated. This ethylene being an unsaturated hydrocarbon, is united with the hydrogen that goes over the nickel with it, and is converted over into a saturated hydrocarbon ethane. Now, just what that catalytic action is, is difficult to determine, but we can look at it in two ways. First, either the hydrogen is obsorbed on the surface of the nickel, which it gives off as atomic hydrogen or else it forms a very unstable nickel hydride, which then itself breaks up easily, giving off atomic hydrogen. Which theory is correct does not make much difference, because the fact is what we get we may call this triple contact,—that is, the nickel, the hydrogen and the double bond all being present at the same time, we will get a reaction in which the double bond opens up, as I have shown it, the hydrogen splits, as I have shown it there, and those two catch hands, and we have the hydrocarbon ethane, shown in Formula 31.

Now, go back a minute to the linolin and consider it as linolic acid molecules united with the glycerine molecule. It really does not make much difference which way you look at them, as the free acids, or not. Sabatier and Senderens attempted to unite the hydrogen to this double bond, but they were breaking that material, linolin, into gaseous form, into vapor form, and it is extremely difficult to vaporize these molecules, and therefore they did not easily suc-

ceed. But a man named Normann found that if one put the nickel directly into the fat or into the oil, that he had the same catalytic reaction; namely, that where we had the unsaturated or double bond of the olein in the fat come in contact with the nickel and at
485 the same time with the hydrogen, that the nickel would act in that catalytic way, i. e., would open up the double bond, and would open up the hydrogen, and the two would unite, and we would then convert oleic acid over into stearic acid; or if those acids were combined with the glycerine, we would pass from olein over into stearin. In the same way having two double bonds in the linolin it is obvious that the hydrogen, if there were a very large amount of linolin compared to the hydrogen, might have a selective action; either it might break one double bond of the linelin and pass the linolin over to olein or it might break both double bonds, in which case the linolin would be converted directly over to stearin. On the other hand, if we had a very small amount of oil and a very large amount of nickel and hydrogen present, it would not be assumed to be selective in its action, but we would have a greater chance of saturating both of these bonds, of the linolin and the latter would pass directly from linolin over to stearin,—although at the same time we would expect in some of the linolins one of the double bonds to be saturated and cause it to pass from linolin over to olein.

Now, that, as a matter of fact is what we get. The experiment to carry on that reaction between the fats and the nickel is a very simple one and a very instructive one. I carried it out in the laboratory using a test tube such as I have here (indicating).

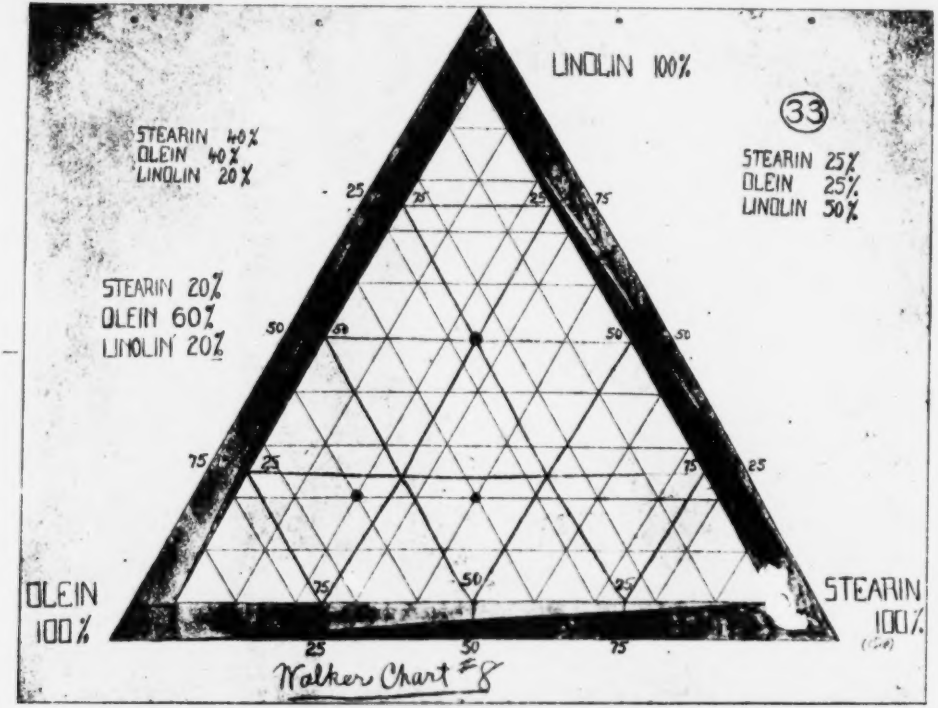
Into the tube I placed the nickel oxide and ran the hydrogen through the tube heating up the tube to about 300 degrees centigrade, as Sabatier suggests, by means of a lamp. The hydrogen passing over the nickel oxid converts it into metallic nickel. Then
486 I placed the cotton-seed oil in on top of it, cooled it down about 170 degrees centigrade and continued to pass in the hydrogen. The reaction that I have described takes place:—the hydrogen unites with this double bond and converts, then, some of the linolin into the olein, some of the linolin into the stearin and some of the olein into stearin, and when we cool it down we have, instead of the oil, the fat which is hardened. This sample was allowed to stand over night in a warm place, so that we have here at the bottom of the tube the nickel which caused the reaction of the oil with the hydrogen over and into the fat.

Now, it is obvious, I think, when we consider this, that the reaction is not instantaneous so far as are all the double bonds being saturated, because we have not enough hydrogen present at any one time to do this, and secondly, we cannot have all the double bonds in contact with the nickel. The reaction will not take place except we have in contact the hydrogen on the nickel and the oil on the nickel. Therefore, we would expect that reaction to proceed progressively and that is the case.

I have here a series of little bottles containing samples taken from a tube just like the one I have, in which we start at one end with the

cotton-seed oil, a very nice sample which we bleached, and at an interval of about one hour took out a small sample; another one at the end of the second hour, we had a number of these double bonds saturated; it is commencing to get stiff; at the third hour it is a little more stiff, and at the end of the fifth it is stiff, and at the sixth hour it is somewhat harder.

(Here follow diagrams marked pp. 486*a* & 486*b*.)



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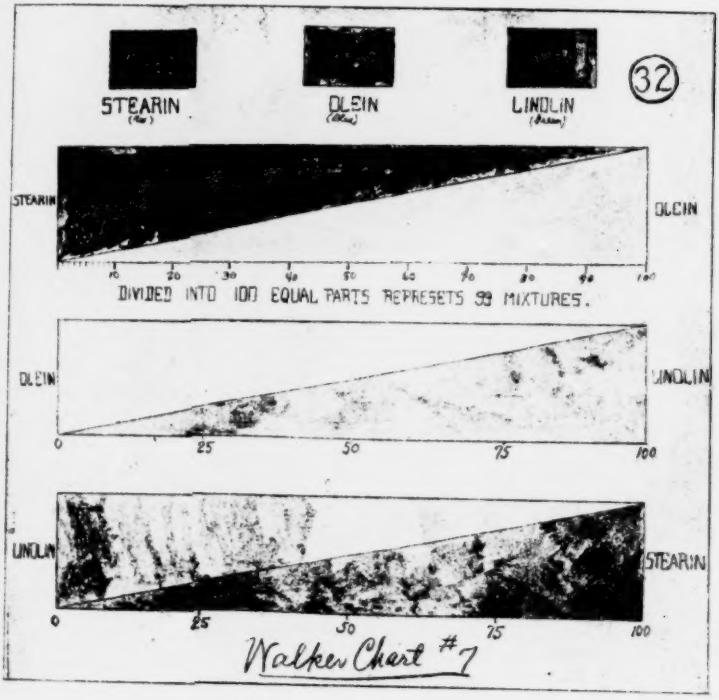


Now, it is difficult to follow, or rather we can determine the course of that reaction by analytically determining the percentage
187 composition of the oil at any one time; that is, we can start out with the percentage of the component glycerides of cotton seed oil and after the first and the second and the third hour analyze the product and determine how the percentage composition relative to linolin, olein and stearin has changed. But it is difficult to compare groups of three figures; it is hard to get any comparison. But if we can get some graphic way of illustrating or representing it, it will be very helpful, and I have what is known as a triangle chart here which I will develop very briefly.

If we call the stearin red and the olein blue and the linolin green in chart No. 7 we can represent a mixture of olein and stearin by a block as we have there dividing it into 100 equal parts. At one end we will have pure stearin; at the other end we will have pure olein, and in one we will have 99 mixtures, and we can determine the mixture by noting the percentage of red and blue. For example, there we have 20 of olein and 80 to 85; a point in the middle would be, of course, 50. Some point over there would be 70 of olein and 30 of linolin, so by noting the relative positions of two points on the chart, we can at a glance see the relative amount of olein and linolin which each of them have.

Now, in the same way, of course, we can have a chart showing a mixture of olein and linolin and also one showing linolin and stearin. But those are only mixtures of two of them at a time.

In these fats we have a mixture of all three. Now, we could show then a mixture of all three if we put those three in the form of a triangle, because then at any one time we would have all three
188 colors, and such a chart I have constructed there.

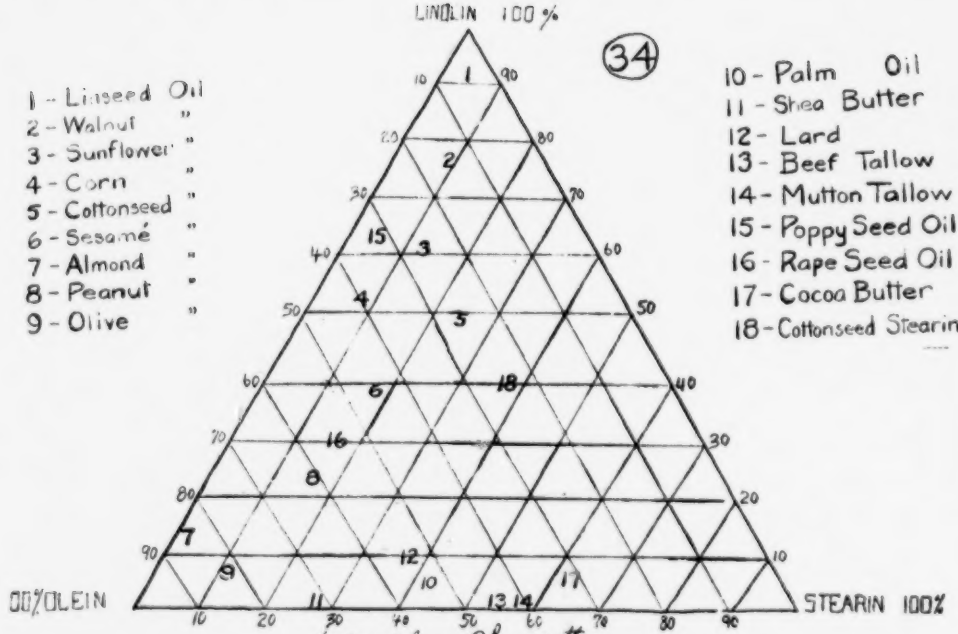
Here, as before, is the mixture of olein and stearin. Here is the stearin and linolin and here is the olein and linolin. Now, that chart as before, I will only mention one very interesting number. You will notice at this point between 75 per cent. linolin. At this point we also have 75 per cent. linolin, so if we join those two bonds by a line we have then a line on which must fall every mixture which contains the 75 per cent. linolin. If the point is over there at the extreme right then the other 25 per cent. is stearin. If it is at the extreme left the other 25 per cent is olein. Any point in between will represent the relative amount of olein and stearin which is in that mixture of 75 per cent. linolin.

Now, in the same way we have here 50 linolin and here 50 linolin, so that line will represent every mixture which contains 50 per cent. of linolin, and the same way here is 25 per cent. linolin and we can construct the same thing for stearin. Here is 25 per cent. stearin which we draw in red, because stearin we have represented by red. Here is 75 per cent. stearin and that point is 75 per cent., so that represents all the mixtures which contain 75 per cent. stearin and here is 50 and here is 20.

Now, in the same way we can get the olein. Here is 25 per cent. olein; there is 25 per cent. olein, so that line represents a mixture containing 25 per cent. of olein.

Now, suppose we had a mixture which we just take at random of stearin, 25, olein 25 and linolin 50; where will they fall on this chart. Stearin is 25, here is 25 per cent. stearin, red, and here is 25 per cent.

(Here follows diagram marked p. 488*a*.)



(Walker Chart #9)

Beckon Miller Co. & Paxton & Gawkey Co. (P & G)

489 red, so that it must fall on that line (indicating). But it also contains 25 per cent. olein. Now, here is 25 per cent. olein, and down at this point is 25 per cent. olein, so it must also fall on that line. Now, the only point where it can fall on both lines; of course, is where they intersect across and that point then must have 50 per cent. linolin.

Now, let us take a fat which is entirely different, and it has 40 per cent. stearin, 40 per cent. olein and 20 per cent. linolin. 40 per cent. stearin, we run along our red line until we come to 40; this is 40 per cent. stearin, but our example calls for 40 per cent. olein, and where the red 40 line intersects with the blue 40 (olein) line, we find the 20 linolin line also intersecting.

Now, we can tell again by just glancing at the chart the relative position of these two fats. For example, that is 50 per cent. linolin. Now, we run down in this direction, 75, 50, 25, and so forth. So I could run through this chart and place any number of points on the chart.

Now, to show the application of that I have placed on this chart a number of the ordinary edible oils, as taken from Lewkowitech who is the standard English authority on oils and fats. Linseed oil I have put in the extreme corner (indicating).

The witness reads the numbers of different oils on chart.

By Mr. Pennie:

Q 29. At the termination of this catalytic action what is the condition of the platinum or the nickel as the case may be?

490 A. So far as reaction is concerned, it is not changed at all. As a matter of fact when used in connection with oil there is always a slight amount of impurity in the oil which in time collects on the nickel. But so far as the hydrogen is concerned there is no action.

Mr. Pennie: Counsel for defendant offers in evidence the charts referred to by the witness.

I wish to state that the charts referred to by the witness will be reduced by a photographic process and incorporated in the testimony of the witness as a part thereof.

Counsel for the defendant offers in evidence the specimen referred to by the witness in his last answer, the sample of stearic acid.
Marked Defendant's Exhibit I.

Also a sample of oleic acid.
Marked Defendant's Exhibit J.

Also the test tube and its adjuncts referred to by the witness.
Marked Defendant's Exhibit K.

The test tube containing the sample of hydrogenated cotton oil referred to by the witness.
Marked Defendant's Exhibit L.

Also the series of samples beginning with refined cotton seed oil and terminating with hard cotton seed oil.

Marked Defendant's Exhibit M.

Q. 30. For — long a period had you been acquainted with the process and apparatus used by the defendant company in the manufacture of its product "Kream Krisp"?

491 A. I have been familiar with the process since its inception in the mind of its inventor, Mr. Moore, in the Fall of 1913, and I have been familiar with the plant at the Berlin Mills Company since the late Fall of 1914.

Q. 31. How did you happen to become familiar with Mr. Moore's invention in the incipient stages?

A. I knew Mr. Moore first as a student in my class at the Institute in 1894, and have followed his progress with much interest ever since. He dropped into my office as he was wont to do, along in the Fall of 1913, and he related to me his ideas as to how he could utilize the hydrogen which they had in such enormous quantities at Berlin, New Hampshire, in the hydrogenation of oil.

Q. 32. How did it happen that the Berlin Mills Company had available at its plant in Berlin, New Hampshire, large quantities of hydrogen?

A. The Berlin Mills Company was originally a lumber company which took over the manufacture of chemical fibre, cellulose fibre from wood, for the manufacture of paper, then, also, the manufacture of paper itself. In making hard fibre from wood for the production of high grade paper, it is necessary to bleach the stock. In order to make the bleach, they installed what is known as an electrolitic decomposition of salt plant, which decomposes common salt by means of an electric current giving as one product gaseous chlorine from which bleaching lime is made and is used on the premises to bleach the pulp, and at the same time caustic soda and hydrogen. The caustic soda owing to Mr. Moore's ideas was placed on the market as such but the hydrogen has for many years been there. The plant is very large and while I have never calculated the volume of hydrogen per hour, it is very large.

492 Q. 33. Have you seen in actual commercial operation the plant of the Berlin Mills Company, the defendant here, in which this apparatus for the production of "Kream Krisp" was installed and in which it is carried out for the production of "Kream Krisp?"

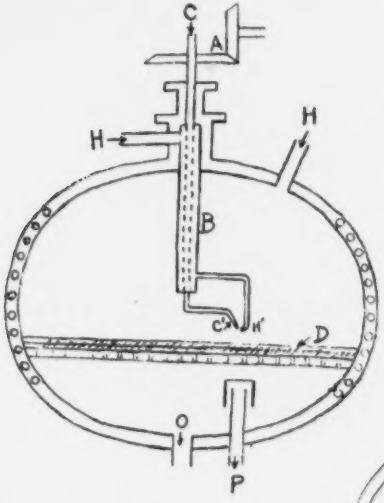
A. I have.

Q. 34. Are you sufficiently familiar with that apparatus and process to be able to describe it to the Court?

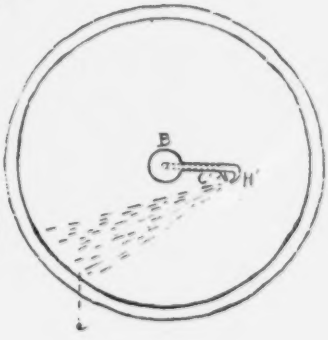
A. I am.

Q. 35. Will you please do so?

A. Taking up first the process as used at the Berlin Mills Company, it will be recalled that in order to get the hydrogen to unite with the fat it is necessary to have the hydrogen and the fat in contact with the nickel. It was obvious to Moore that in a process of this type where we bubble the hydrogen through the oil, that the contact of the hydrogen with the oil was very imperfect because at all times



(Walker Diagram #11)



433.

Berlin Mills Co.
v.
Procter & Gamble Co. } D.C. 492 a

the nickel was enclosed in or covered with oil. It occurred to him that if he could devise a method by which at times the hydrogen would blow off the oil from the nickel, he could then saturate the nickel, as it were, with hydrogen, and then when the oil film was brought on he would get a rapid and complete reaction. That conception proved to be a valid one and he constructed an apparatus of this type as shown in chart No. 11 (indicating).

Looking now at Chart No. 11, the hydrogenator is a cast iron or boiler plate shell, of which the cross section is round. Supported at the periphery and extending from one side to the other to divide the shell into two parts is built a diaphragm or partition consisting first of a cast iron plate filled with holes, upon which he built up his nickel catalyser. It is necessary in order that the nickel catalyser may be made active not to allow it to come in contact with the air before

(Here follows diagram marked p. 492*a*)

the oil reaches it. Mr. Moore therefore built up the cata-
493 lyser bed with nickel oxide instead of nickel and then reduced it to nickel from the nickel oxide in situ as it were, after he has it in place. That is he then passes through his bed of catalyser, namely, the nickel, a strong current of hydrogen which passes down from the pipe H through the bed of the catalyst and passes out through the place at the point P. That has the effect then of saturating the nickel with hydrogen. He then passed the oil down the center tube at C and allowed it to discharge at the end of the point C at the orifice C'. He brought then a current of hydrogen in at H which came down through the spindle of the tube C and out the tube H'. Here he met then the oil as it passed from the jet C', with a stream of hydrogen and atomized the oil in exactly the same way as we atomize any disinfectant, for example when we wish to clear out our throat or nose. This made a frog or spray of oil in an atmosphere of hydrogen. When this oil then reached the catalyst the hydrogen blew it through the catalyzer bed, as it were, and we had then the triple contact of the nickel, hydrogen and the oil.

Now, in order to make the contact periodic he revolved this shaft so that this spray of oil rotated around the center here. This apparatus is represented in section in the lower figure. This is a plane view in which we have turned the jets a little bit in order to make them somewhat clear. The hydrogen atomizes the oil in a segment of about 15 degrees. Now, as this jet rotates about its axis as it is discharging oil upon the catalyst it continuously discharges the oil upon a fresh surface of catalyser. When the oil is
494 not being discharged on one area of the catalyser the hydrogen is pushing through the whole diaphragm, so that it is washing away from that part of the catalyser on which no oil is being deposited at that time, the oil film which was there, and is therefore saturating the nickel constantly with hydrogen. The result is that, whereas, it took two or three hours in an apparatus of that kind in which the hydrogen is bubbled through the oil to get a hardening effect, namely, so that enough of these double bonds are saturated with hydrogen to convert enough of the linolin and olein over to the stearin to make it hard, here it is done in a fraction of a second. It takes a good deal less than a second for the oil to pass through the catalyst and one passing through hardens the oil. That is, once passing through the diaphragm, the oil then passes out of the orifice D and is a hard product.

That then is the principle of the apparatus. In order to carry it into effect it is necessary to build this diaphragm of nickel oxide mixed with some asbestos, in order that it will not pack so tightly that the hydrogen cannot pass through.

I have here a sample of the green crude nickel oxide as it is bought, mixed up with the asbestos and I have also a section of one of these diagrams, taken out of a capsule, which shows the construction of it.

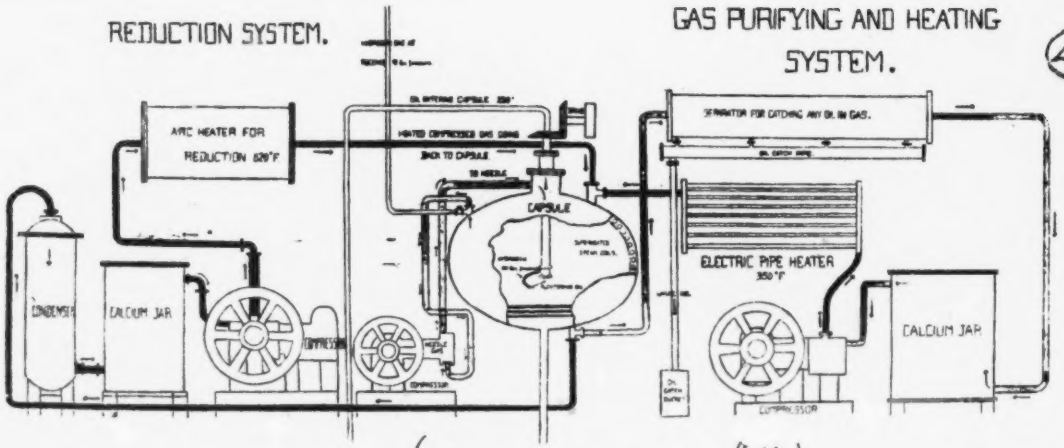
This section illustrates a cross section of the diaphragm with

433.
Berlin Mills Co.
v.
Procter & Gamble Co. } D. 494 a

REDUCTION SYSTEM.

GAS PURIFYING AND HEATING SYSTEM.

(40)



(Walker Diagram #12)

everything except the cast iron plates on which it rests. First comes the cast iron plate with the holes through it; then a relatively heavy piece of iron wire gauze; then a fine wire gauze which is a little difficult to see, and on top of that a piece of asbestos paper. That is to keep the hydrogen from blowing any of the nickel through.

(Here follows diagram marked p. 494*a*.)

495 Then comes this mixture of nickel and asbestos; and then another sheet of asbestos and more of the nickel product, and then on top a sheet of this fine wire gauze and the heavy gauze to keep the blasts of hydrogen from blowing it around.

The operation then is as follows: First, we place in position the catalyst. Then we heat up the capsule by means of superheated steam introduced with coils (indicating) and then hydrogen, heated very hot,—up to about 800 degrees Fa-renheit,—is passed through the diaphragm. The result is just the same as we had in this test tube, that is the hydrogen reduced the nickel oxide, giving us the nickel in the capsule. The water formed from the nickel oxide and the hydrogen passes out with the hydrogen. This flow of hydrogen is kept up until the catalyst is entirely reduced and we have then a sheet of active nickel, metallic nickel. The hydrogen then is cut off, the capsule then is allowed to cool somewhat, and then two streams of hydrogen are turned on. This atomizer is rotated by means of the gear shown at A and the spray or fog of oil is continuously thrown on different parts of the bed and is forced by the pressure of the hydrogen through the active nickel catalyzer, wherein the reaction takes place.

Now, the lantern slides that I have prepared to show the plant are rather too small to indicate these three systems of hydrogen so I have a little chart to make that clear, chart No. 40.

Here, in chart No. 40 as before, is the cast iron capsule; here is the diaphragm and here is the rotating shart containing the nozzle which sprays the oil. Now, the hydrogen comes from the chemical plant in through the tube at the top of the drawing and it
496 is all the same, but I have divided it into three parts or systems which I have colored differently in order that it may be a little clear. First that part of the system, colored black, is that for the hydrogen which is used to prepare the catalyst, namely, to reduce the nickel oxide to metallic nickel; and which must be heated to about 800 degrees Fahrenheit. First the hydrogen passes through an electric arc heater; that heater is heated up to about 800 degrees Fahrenheit. Then the hydrogen passes through the capsule and through the catalyser, reducing the nickel oxide to nickel, and forming the water vapor which passes out with it; then through the condenser to condense the water vapor, then through the calcium chloride jar, where the hydrogen is dried, then through a compresser which raises the pressure of it. That then is the first circulating system for the hydrogen which we may speak of as being the high temperature hydrogen. The second circulation system I have marked in green and that is for the hydrogen which is compressed to about 100 pounds and is used to atomize the oil. It comes down through the center of a rotating shaft and makes the spray or the fog of oil. The third system is the main one so far as volume is concerned in which the gas is compressed and forced down from the capsule, running it through the red system here, first, through a separator which is of the baffle plate type to catch the oil which is carried adong with it by entrainment. That oil is separated out and runs down through this pipe into an oil catch at the bottom.

The hydrogen passes through the calcium chloride jar, to remove the moisture, then is compressed to a higher pressure, then passes through an electric resistance heater and is thus so circu-
497 lated so that we have this circulation of hydrogen taking place all the time.

With that explanation I think I can show best by the lantern slides the plant as a whole. We have here a diagrammatic view showing a cross section of the plant, somewhat conventionally and condensed. That is, portions are in different parts of building, but they are all shown together in order that we may get them on one slide. On this upper floor you will recognize the operation of the plant which we have just described in detail.

The course of the oil is as follows: It first comes in from the tank at the outside into this preheating tank which heats the oil up. I can give all those temperatures if it is considered worth while later; I have my notes, but I cannot read them in the dark, and so I will have to pass over that part of the description which is devoted to the temperatures.

The oil is preheated and is then forced by means of these pumps up here (indicating) through the capsule and at the same time this hydrogen is passed through, the oil which has been treated is discharging from the capsule into this large tank underneath the capsule.

Q. 36. May I ask the witness to talk a little slower, I am afraid that the stenographer will not be able to get it.

A. Yes. Excuse me. While passing through the capsule the oil acquires some color, at least the oil itself is slightly colored; that is, the hydrogenated oil has more color than is commercially desirable, therefore in this tank it is brought by agitation in contact with Fuller's Earth, which is a clay used for the purpose of bleaching it. It requires about twenty minutes to bleach that oil and then it is passed—this is hydrogenated oil now—it is passed through
498 the filter press, where the Fuller's Earth is removed—this may be called the Fuller Earth press where some of the color particles, that is, the coloring matter of the oil is removed with the Fuller's Earth.

Some odor has been introduced at this time so that it must be or is deodorized; this is done by pumping the oil into a very large tank which is fitted with steam coils within it to heat the oil. Then the oil is blown, as they say; or I should first say, it is treated with steam, that is, with steam superheated to a relatively high temperature, as this steam passes through the oil particles of the oil that are entrained with it collect on these pipes and drain down in the lower part of the building. All of this deodorizing process is carried on under a pretty high vacuum, which is maintained by these vacuum pumps and there is maintained as a rule a vacuum of twenty eight or twenty nine inches within this vessel.

By the Court:

Q. 37. What vessel is that?

A. That is this deodorizing vessel, this iron tank. We have here a

catch-all so that any oil that is entrained by the steam passing through the oil is caught here and it will then go back into the vessel while the steam passes down from here through the condenser and thence to the vacuum pump which maintains the pressure.

Q. 38. That is the tank that deodorizes it?

A. Yes, sir. The steam is blown directly into the oil. There are two methods of heating this by steam, by one the steam is passed through a heating coil, and the other method of treatment is
499 that the direct steam is blown into it, which steam has been superheated by means of the furnaces at the base of the building.

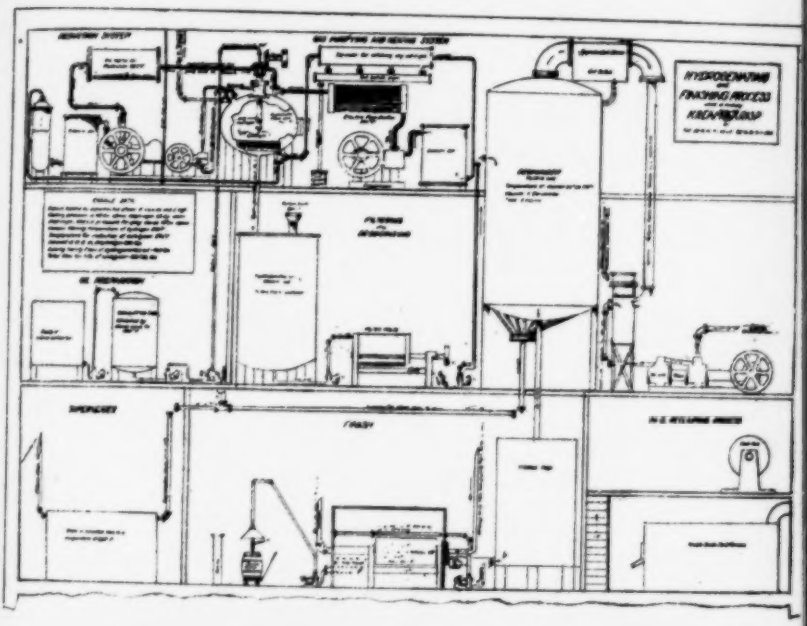
After it has been deodorized the oil is then dropped to a storage tank where it is cooled. From there it is run on what they call "lard rolls" which are rather poorly shown here on this view. These are hollow rolls which are maintained at very cold temperatures by brine circulating through them, and which has been cooled thereby to a temperature of from six to ten degrees below zero Fahrenheit. The oil is picked up by the rolls and it is spread on the rolls and is immediately chilled, which chilling prevents it from separating into its constituent parts in any manner. Then while the oil is in that chilled condition they have to scrape it from the chilled rolls into this trough. This is done by blades or scrapers as they are called. Then the chilled oil is passed or is dropped into this picker apparatus, whose function is to beat the air into it, which makes it somewhat whiter and somewhat lighter. It is then pressed, or, rather, taken out by a pump which adds some pressure to it and is discharged into the packages in which it is intended to be shipped.

That, then, is the course of the oil through the system. Now the plant consists also of the furnaces in which the catalyser is recovered after it has been run for six or seven days, according to the amount of oil that is passed through, about six hundred pounds per hour being the capacity of one of these capsules.

These can be taken out,—the catalysers,—and the *the* oil burned off, and they can be rejuvenated and revivified. That is done in a little house at one side of the main building which I will show later in the photographs.

500 Having thus seen the system as a whole, we will now see a part of the plant by means of lantern slides. The first picture shows the transformer house, in which the high potential current is transformed and delivered to a point where we are furnishing the power to the compressers and other electrical apparatus throughout the mechanical part of the plant. We will not tarry long here unless there are some questions to be asked.

This next photograph shows the plant as seen from the West. Here is shown the oil tank which we can see in another view, the storage tank; and here is the hydrogen main, the pipe going up the river to the chemical plant that way. The hydrogen comes down in the pipe, and is compressed in the vessel which is to be shown in a little while. The oil is stored here and conducted into the plant as needed.



433
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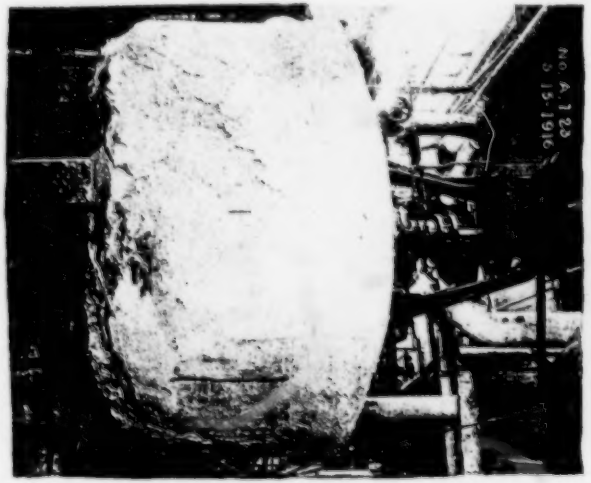
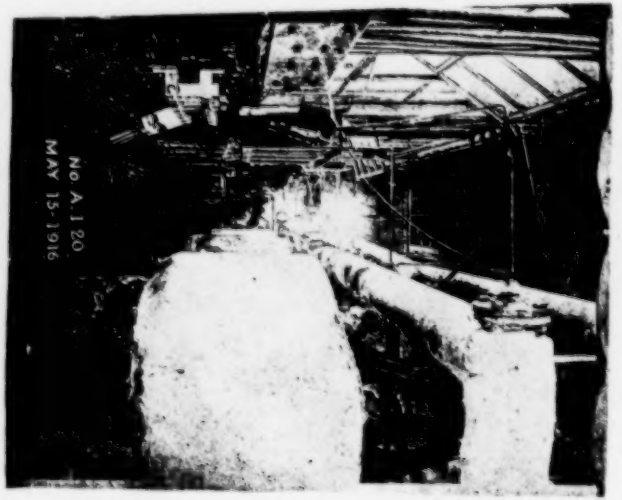
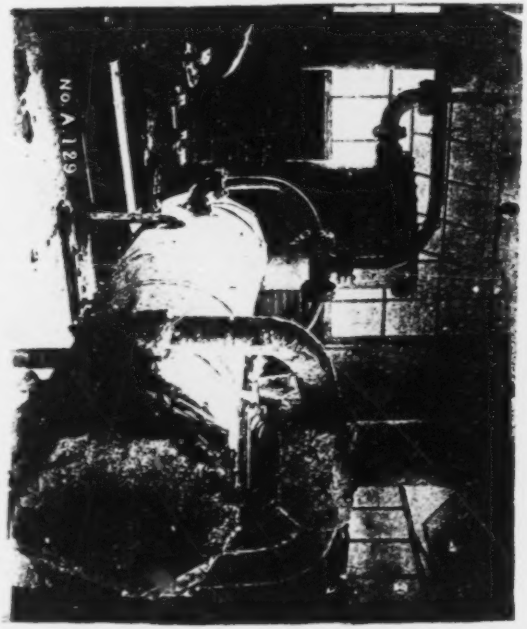
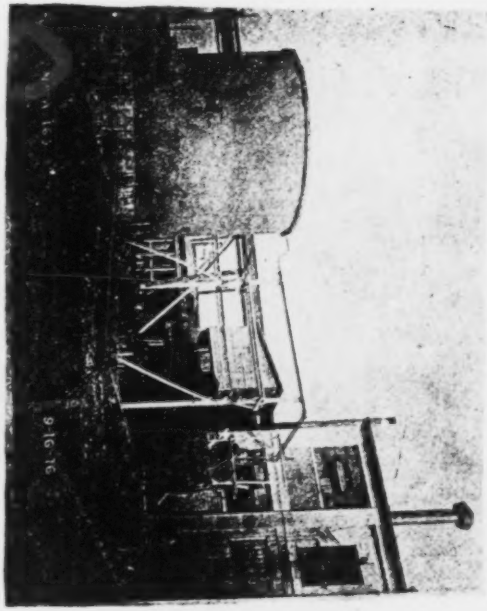
Ex. 33
Berlin Mills Co.
v.
Procter & Gamble Co } P 500 b





Berlin Mill Co.
v.
Procter & Gamble Co. } Ф 500 C





By Mr. Pennie:

Q. 39. Might I suggest that you refer to these views by numbers, that is to number these photographs as we go along, as it will help in identifying them in the minutes?

A. The one just described is A-161.

This next photograph is A-162 and shows the plant as seen from the West. We have at this portion of it the can making machinery, in other words, the plant devoted to making the packages of tin cans in which a part of the product is packed.

This is the packing room where the product is packed ready for shipping, and this is the portion of the plant where the hydrogenation takes place.

(Here follows diagrams marked pp. 500*a* to 500*c*, incl.)

This is photograph A-165 and this shows the upper end of
501 the plant with the oil tank being filled from a tank car of cottonseed oil, on a spur track.

This is the hydrogen storage tank which is ten feet in diameter and I think some 40 feet long in which the hydrogen gas is compressed to 145 pounds pressure and is stored, as a matter of safety, a short distance away from the main plant.

This is photograph A-129. And we have here the first arc heater by which the hydrogen is heated to the high temperature which is necessary to reduce the nickel oxide to form the catalyser.

This is the electric heater through which the hydrogen passes.

Here can be seen just the body of the condenser. This is the calcium ch-oride jar. After the hydrogen is compressed, then it passes through this, this is where the furnaces are, and it is heated, that is this is a special furnace, an electrical furnace, and the hydrogen is passed through this lagged pipe to the capsules at a temperature of about 800 degrees Fahrenheit.

This photograph is A-120 and these are the three capsules. Here is the first one and the second one and the third one which look white because they are lagged with magnesia heat insulation. They stand high upon pedestals and the course of the oil can be seen here passing down through the center. Over here are the pipes which are carrying the hot hydrogen. You can just see just a very little of the shaft which drops down through the capsule which I think is shown somewhat over here but is shown much better in another picture.

Over here are the switch boards and electrical apparatus and devices of various kinds.

502 This is photograph No. A-123. This is really looking upward into the capsule. You can see this special shaft, and the wheels which drive it. The hydrogen gas pipe and the oil pipe comes down through the center of the shaft. The shaft is lubricated with cottonseed oil, so as not to contaminate the contents of the capsule with any other oil.

This is photograph A-171. This is the capsule with the manhole or door open and you can see the jet, the little supply jet of oil. The jet that leads the hydrogen in, is located on the shaft and is operated so as to spray the oil and have it thrown up in a lateral direction, hitting about the center of the area occupied by the catalyser. You will note that this is a little off the center, and you will notice that this is the center here of the apparatus and you will note that this atomizer is a little off the center in order that the entire area of the catalyser can be covered. In other words, at the temperature that the oil is heated it has been found to be difficult to have it spread over the whole surface and the attempt is made in this way to cover the entire area of the catalyser body by this means here.

This is No. 172 and this is a near view of that manhole looking into the capsule and is a very striking photograph. This is the opening where the hydrogen comes out and the oil comes down through the center, and this is where the hydrogen meets the oil and it spreads

(Here follow drawings marked pages 502*a* to 502*c*.)

Berlin Mills Co
v
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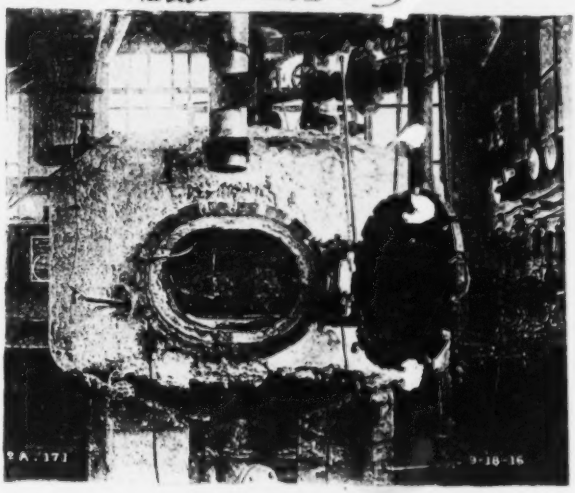

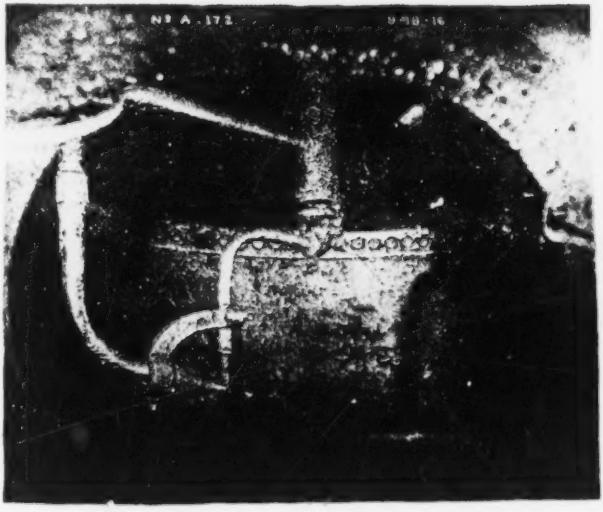

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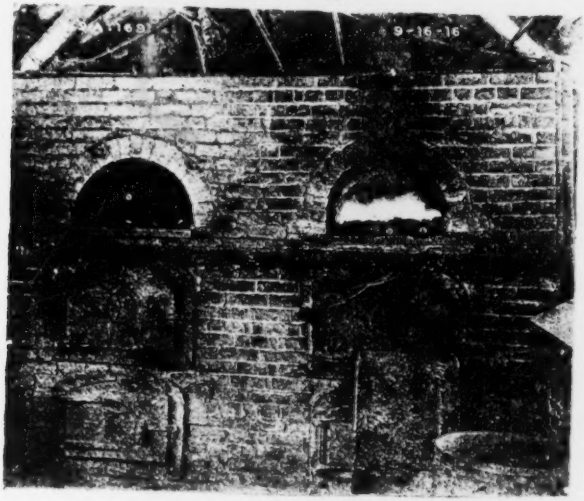
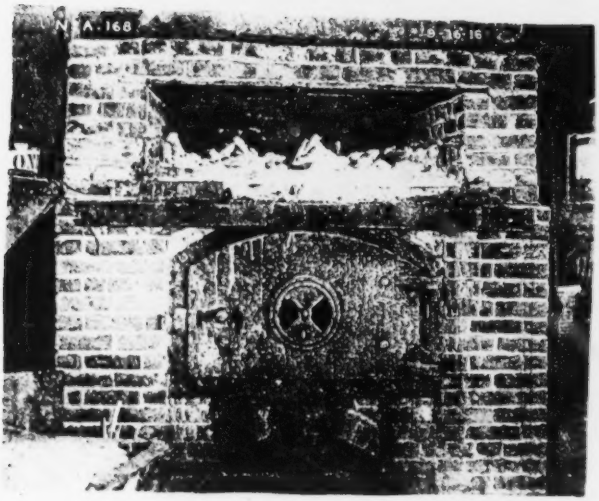
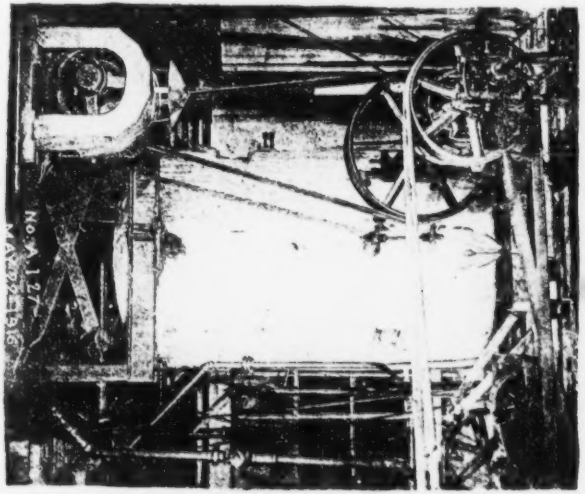
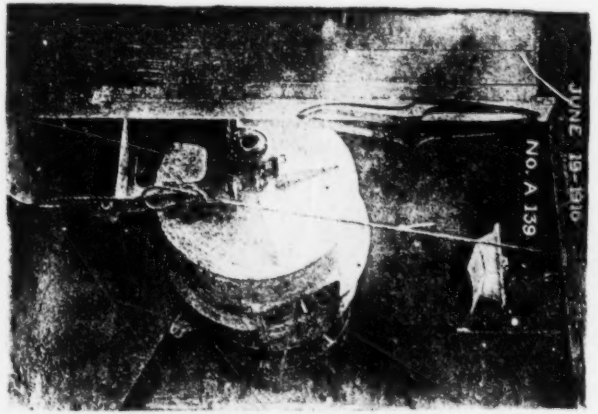




Berlin Mills Co. 433
v
Procter & Gamble Co } D. 502





it out here in a spray or fog, all the time of course there is a great volume of the hydrogen coming down through the capsule and being blown over through the catalyser which is kept thus constantly active and the two constituents, the nickel and the hydrogen,
503 are thus brought in contact with the oil, and in this state the oil is passed through as you can see over here.

The next is A-169. This is the furnace for the revivification of the catalyser after it has had seven or eight days' use. The catalyst is placed in one of these furnaces and the organic matter burned off it, and that gives us the nickel oxide. In other words, the nickel of the catalyser of this process is converted back to nickel oxide and it is cleaned of the organic matter which has collected on it by the passage of the oil through it.

This is A-168. This is a furnace in which the calcium chloride used to dry the hydrogen is dehydrated. That is after it has taken out as large an amount of water vapor as it will, then it is taken out and placed in this furnace to be melted down and the water can be driven off and then the whole mass is once more broken up and again is used over.

The next is A-139. This is a ball mill in which the nickel oxide from the furnaces is ground. This is the cylinder in which we have a number of small balls. When the cylinder is rotated the balls impinge on one another and give us a grinding action. The nickel oxide is ground until it passes through a 200 mesh sieve, that is, a sieve which has 200 openings per linear inch. It is here mixed with about five per cent. of asbestos as was shown in the sample and is ready to be placed in the capsule.

This is A-127. This is the oil preheating tank. That is a tank in which the oil is placed when it first comes into the building and is heated up to the requisite temperature. From here it flows by means of these pumps and is forced up to the top of the building into the capsule.

504 This is A-125. This shows the three pumps, the high pressure pumps, one for each capsule which feeds the capsule with the oil. This filter press has not anything to do with it; it happened to be standing there at the time. This oil goes up into this capsule at the top, through this pipe.

This is A-173. It is a little difficult to see it, however. This shows one of the electric heaters in which the hydrogen is heated before it passes to the capsule while the hydrogenation is taking place. We might call it the low temperature hydrogen heater. This is the ceiling up here, the tubes hang from the ciling, I should say. Another photograph gives you a better view of it.

Each one of these tubes of the low temperature heater is fitted with a high resistance coil, and an electric current passes through the wire so that the tubes are heated and the hydrogen passing through these tubes is heated to the requisite temperature before it passes into the capsule.

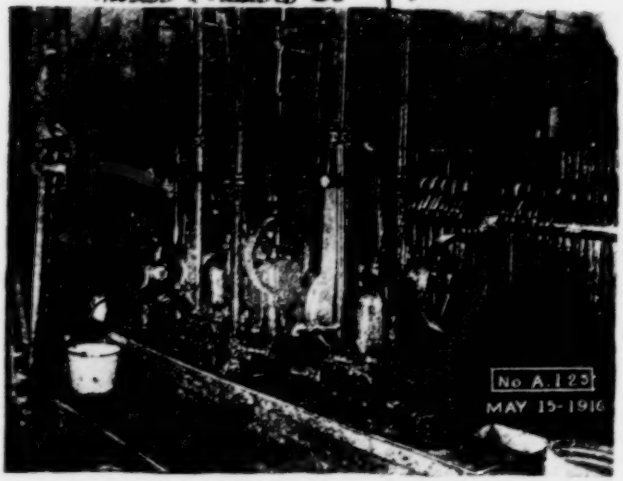
This is A118. This shows the filter press in which the oil is separated from the fuller's earth with which it has been de-colorized in

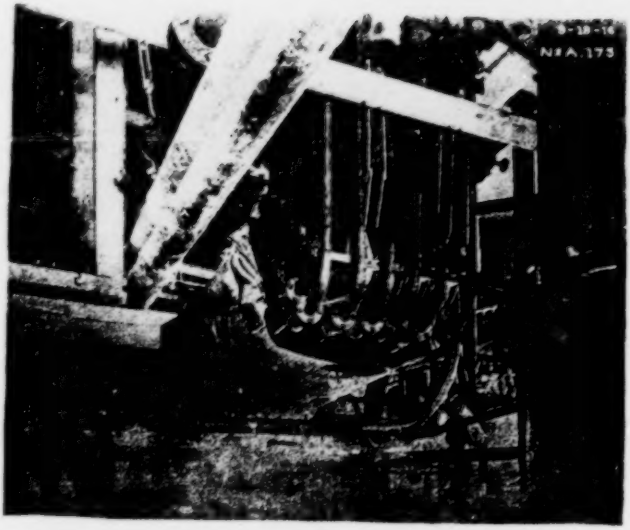
the big tank to the left. The oil is pumped through this press here, you might call it, in which the filter cloth is placed, and the fuller's earth is left or retained in the press while the oil runs out here by gravity to this opening and is pumped up into the deodorizer.

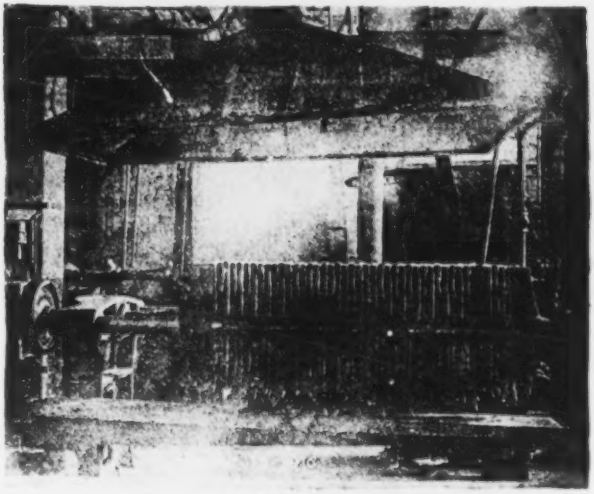
This is photograph A128. This shows the baffle plate condenser for the hydrogen which leaves the capsule after the oil is hydrogenated and passes from the capsule. It (the hydrogen) carries with it a little of entrained oil which must be removed before the hydrogen is again heated. This condenser is filled with baffle plate

(Here follow diagrams marked pp. 504*a* to 504*d*, incl.)

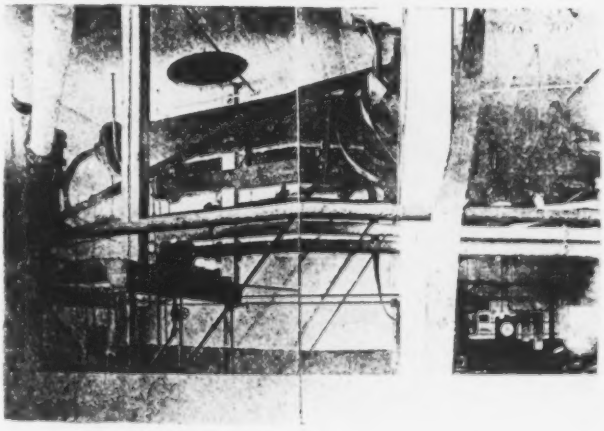
433.
Berlin Mills Co
v.
Procter & Gamble Co } D. 501 / a







433.
Berlin Mills Co
v.
Procter & Gamble Co } Def's Exh'ts



433
Berlin Mills Co
v.
Procter & Gamble Co
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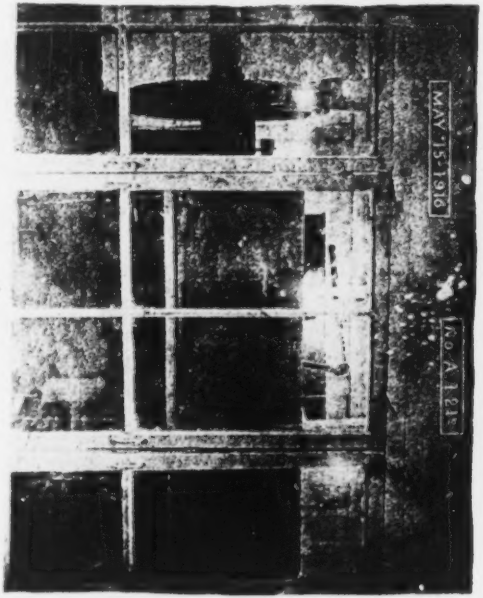
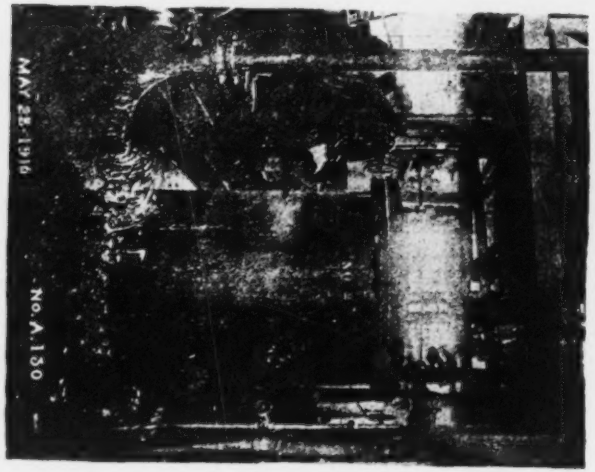
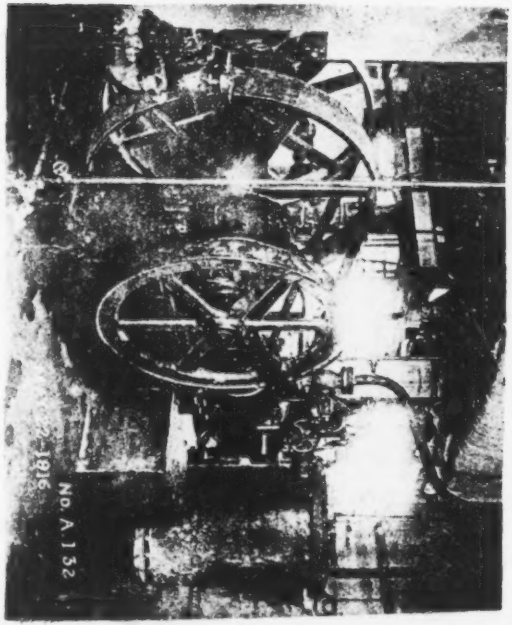
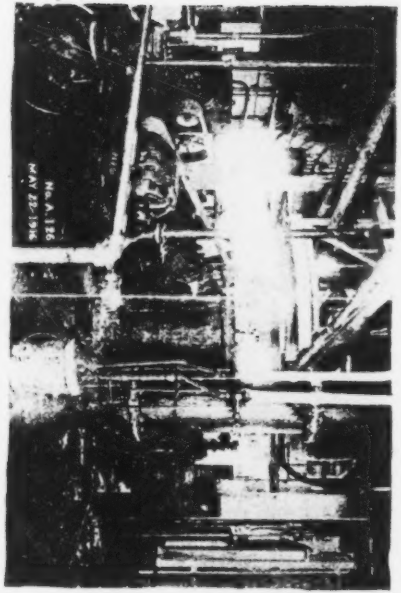




#33.
Berlin Mills Co.
v.
Procter & Gamble Co. } P. 504 a





and so as the hydrogen impinges on the plates, the oil sticks
505 to the plates and runs down the sides of the pipe to the container. That removes the oil from the hydrogen so it then can pass on through the condenser and the pressure pump and is again ready for circulation.

This is photograph A126. One sees here the condenser, and here is the motor that drives the compressor; and here is the end of the compressor. The capsules are over here by the windows; while one sees here the calcium chloride by means of which they dry the hydrogen and here are the pipes that go over to the condensers. This is the general carrier from the deodorizer which stands over on this side of the building.

This is A132 and is a picture showing one of the compressors and one of the calcium chloride drying jars, and the motors and the large pipes with which it is connected. There is not much else to say about that.

This is A130 and this is a nearer view of the compressor and the calcium chloride jar. We see the capsules are over here in the distance. These are the circulating pipes for the hydrogen.

This is A121B. This is the lard roll here so-called or it might be called the chilling roll which solidifies the oil practically instantly in order that there shall be no segregation. It is within a glass case. These are all windows in order that it may be entirely sanitary and free from dust and the air which it is supplied with is carefully filtered. The brine is circulated through the refrigerating system coming through this roll, which is maintained below zero so that the oil as it is acted upon is cooled constantly. This chilled oil is scaped off, this that is on this chill roll, and goes to the place in the factory where it is mixed up with air by means of the rotated plates of the picker.

506 This is photograph A124. One sees the windows here of the cooling roll which is in this little glass house and from which the finished and hardened oil is pumped around down around through the pipe shown here into the packages in which it is packed for shipment.

Here is photograph A131 and this is a picture immediately under the capsule. This is the outlet too for the oil from the capsule which it is immediately over. It passes down and through this insulated pipe so as to keep it hot so that it will not solidify until a subsequent operation takes place further along in the factory.

This operation is controlled by withdrawing here a sample periodically into a "watch glass" and putting that sample on a cake of ice in this refrigerator. This little sample is carefully watched and the melting point of it noted so that the proper conditions of the reaction can be constantly watched. The oil after it has hardened passes through this pipe over to the deodorizer tank which we have seen in one of the other pictures.

This is No. A182 and this is a view of the main can factory which is equipped with the most modern automatic mechanical machinery. I will not go through that any more than to say it is a wonderfully perfect establishment and works beautifully.

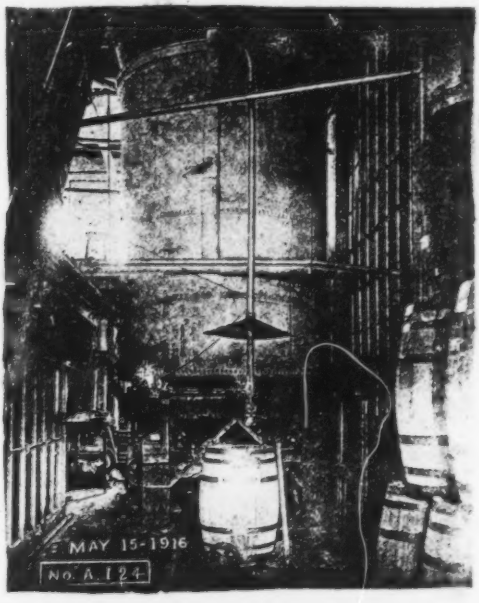
This is A184 and that shows draw presses of the can operating department, where the labels are stuck up and the bottoms put on the cans.

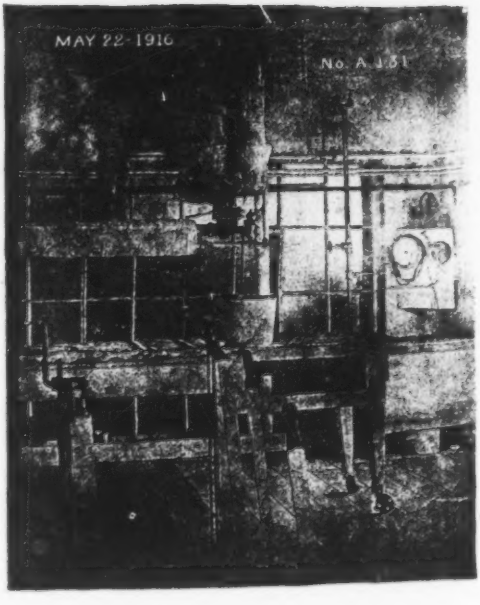
This is A183. Another portion of the can making machinery where the cans are taken up through the automatic soldering device and over into the testing machine.

This is No. A185, which is the automatic testing machine
507 where each can as it comes from the soldering machine is placed under pressure and any evidence of leaking is at once observed and the can discarded.

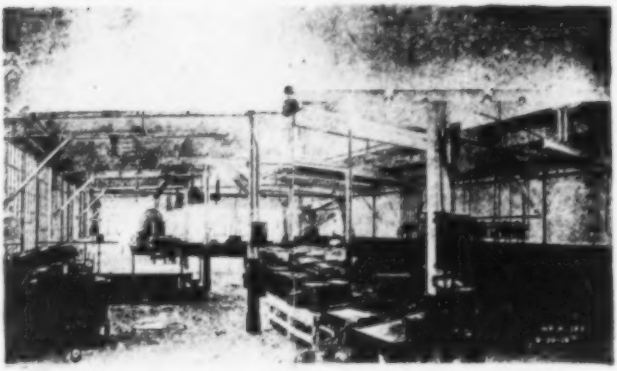
(Here follow diagrams marked pp. 506*a* to 506*c*, incl.)

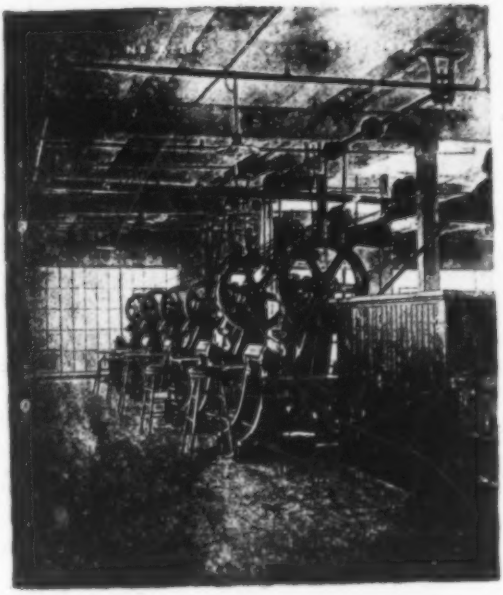
433.
Berlin Mills
v
Procter & Gamble Co



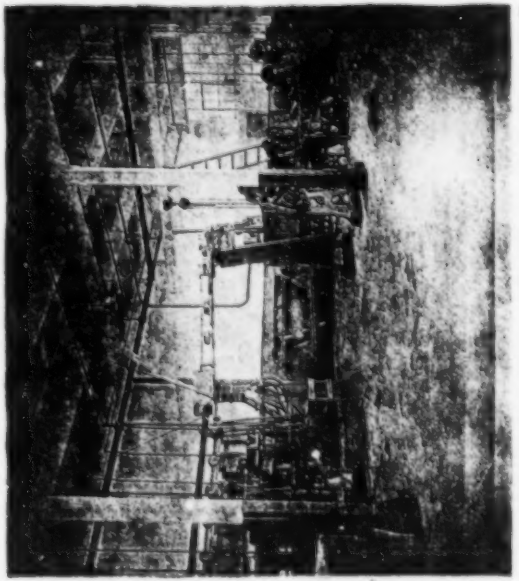


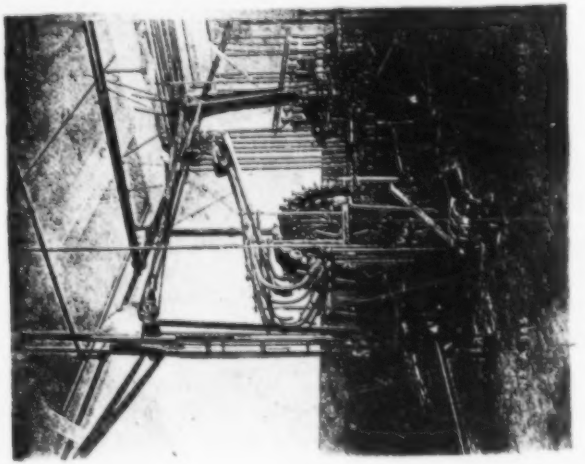
Berlin Mills Co
v.
Procter & Gamble Co
} ⊄ 506





433
Berlin Mills Co.
v.
Procter & Gamble Co } Ex. No.





This is A179——

The Court: All this has not anything to do with the case. What is the use of having it?
Mr. Pennie: Not much.

A. (Continuing:) We are all through, your Honor, this is the last one.

Mr. Pennie: This is the last view, I guess.
The Witness: Yes, this finishes the plant.

Mr. Pennie: Counsel for the defendant offers in evidence the drawings referred to by the witness in the last answer and will have them properly lithographed so that they may properly appear as part of the defendant's case.
Mr. Gifford: In order that we shall not appear to acquiesce even impliedly in this thing, we object to the drawings and photographs and the testimony about it as irrelevant and immaterial.
The Court: I don't know what all these pictures of the plant are supposed to show. Of course some of the earlier ones show and illustrate that condition.
Mr. Pennie: That is to show that the plant is actually operated and is a thing in esse. We have to make out that fact.

Defendant's Counsel offers in evidence selected numbers of the photographs that have been exhibited by the witness.

708 The Court: When did your client begin this business?
Mr. Pennie: The doctor perhaps can tell you that.

By the Court:

Q. 40. When did the Berlin Mills Company begin business?
A. In the Fall of 1914 they were in operation, that is when I first saw the plant.

By Mr. Pennie:

Q. 41. You first saw it in the Fall of 1914?
A. Yes.

By the Court:

Q. 42. Where? Was it up in New Hampshire?
A. Berlin, New Hampshire, just north of Mount Washington, in the mountains.
Q. 43. This is in connection with the pulp and paper business?
A. Yes, in order to utilize the hydrogen.

Five photographs and a chart marked Exhibit N showing the operation of the plant.

By Mr. Pennie:

Q. 44. Referring again to the defendant's process as carried on in the products that you have described, what happens to the linolin in the original cottonseed oil in the conversion of the oil by the hydrogen into a product of a melting point of "Kream Krisp"?

A. The linolin is changed to stearin very largely. Whether
509 it passes first to olein and then immediately to stearin it is of course impossible to say, but the resultant product shows a slight increase in olein and a relatively large increase in stearin and a large drop in the percentage of linolin.

Q. 45. In what respect does the change from linolin to stearin differ in the defendant's process from the change effected in the linolin in the process of the kind that you have described as having been practiced by you, that is to say those that are exhibited in the samples that you have produced of oils hydrogenized by yourself?

A. Oils such as I have hydrogenized myself we frequently speak of as being produced by the batch process inasmuch as one quantity of oil was treated for some time by itself or until it is finished, in contradistinction to the process of the defendant which is a continuous process. The condition is most marked in the change of the three constituents of which the cottonseed oil is made up. In the batch process we have a very large amount of oil as compared to the amount of hydrogen and the nickel at any one time. The result is that the linolin is stepped up (if we may use the term), to olein is small and a very small amount of linolin to stearin. In the process of the defendant on the other *other* hand we have a quick reaction in which the linolin is stepped up immediately to stearin with a very slight change in the percentage of olein. I can show that graphically with another chart which I have.

Q. 46. What is the number of this chart?

A. This is chart, let us say, No. 401. In this chart I have plotted in the vertical lines the percentage composition on this side, of the average cottonseed oil. That is from zero up to 22,—we have 22 per cent. of stearin. We have 32 per cent. of olein and 46 per
510 cent. of linolin as nearly as I can read it just from the chart.

By the Court:

Q. 47. Now wait a minute. What do you mean by "from zero up to 22?"

A. That is there is 22 per cent. of stearin, so that this distance represents the amount of stearin present in cottonseed oil.

Q. 48. Yes, I see.

A. Then there was 32% of olein.

Q. 49. Yes, I understand.

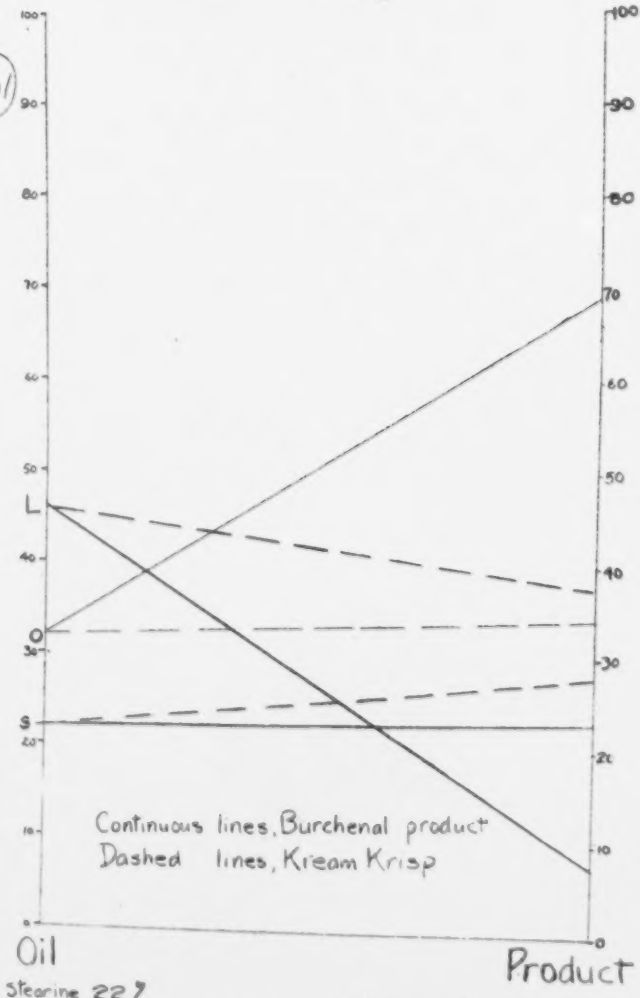
By Mr. Pennie:

Q. 50. Proceed.

A. On the righthand side is the product. The heavy lines repre-

Burbo Mills Co.
v.
Procter & Gamble Co. } D 510a

(401)



Stearine 22%
olein 32%
linolin 46%

(Walker Chart #13)

sent the batch process as done from the Burchenal patent; while the dotted lines represent the product of the defendant. Take first the stearin, the heavy lines show the progress of the stearin. It increases very slowly from 22 to about 23.

The process of the defendant is shown in the dotted line and gives a much larger increase from 22 to 28. The olein again, the heavy line, is the batch process and shows a very large increase in olein, up to 70 per cent. The dotted line shows practically no change in the olein content of the product as made by the defendant's process.

The green, again, is the linolin; that heavy line shows a very great drop in linolin in the batch process while the dotted line shows the change, or much smaller drop of the linolin in the defendant's process. That graphically gives the difference in the action of the two methods of hydrogenizing the oil.

(Here follows diagram marked p. 510*a*).

511 Mr. Gifford: Will you state what the drops in linolin are?

The Witness: From 46 in linolin to 7½ in the batch process; and to 37½ in the defendant's process.

By the Court:

Q. 51. That simply means that they do it considerably less, than is, the defendant's process in hydrogenizing?

A. The defendant hydrogenizes much less than that, and it takes different materials, that is, it is a different material by reason of the different mixture. You see the olein in the defendant's process scarcely changes its relation or relative percentage while in the batch process the olein is enormously increased.

By Mr. Gifford:

Q. 52. What are the figures there, will you state the numbers?

A. The olein starts at 32 and in the batch process ends at 70 while the olein of the defendant's starts of course at the same place and ends at 34½.

By the Court:

Q. 53. Have you used this product in your own household?

A. Have I personally?

Q. 54. Have they been used in your household, Crisco and Kream Krisp?

A. I have used "Kream Krisp" more especially from our interest in it; I don't know whether we have ever used Crisco or not.

Q. 55. You have never tested it practically, I don't mean chemically?

A. We have "Kream Krisp."

512 Q. 56. Yes, but you have not the other?

A. I don't remember that we have, your Honor, I am not very conversant with my house on that.

Q. 57. So you cannot say whether that practically answers the same purpose in general?

A. Not from my own experience, no; but I think there is no doubt but what that they do.

Q. 58. Well, then, isn't it a fact practically and broadly speaking that their practical difference is only one of degree?

A. So far as the utility is concerned?

Q. 59. Yes.

A. Not if what the patent says is true of the Burchenal process because the linolin which is supposed to become rancid much more rapidly on account of its double bond, has, in that process been very much decreased and therefore should become more stable. While in the defendant's procedure the linolin has not been very greatly decreased and therefore cannot expect to be so favorably considered so far as that property is concerned.

Q. 60. It is true, though, isn't it, that the atomic test (if that is the correct word to use) here in the broad and general sense is one of

degree, I mean one caused by a greater introduction of a single other element?

A. Much greater in the sense that there is more hydrogen introduced.

Q. 61. I mean it is greater in degree, volume?

A. Yes, there is more of it, more double bonds in this article although there were different double bonds in the molecule. Let me add that while they may serve the same purpose from the organic and chemical standpoint, we would not say they are the same compound because there is a different compound left by the linolin in the defendant's product than in the batch process.

513 By Mr. Pennie:

Q. 62. Supplemental to his Honor's inquiry about the uses of these materials, is it not also true that the familiar compounds known as lard compounds, and made up in large percentage, 85 per cent. of cottonseed oil and 10 to 15 per cent. of oleo-stearin are likewise utilizable in admixture economically for the same general uses?

A. That is true, yes.

Q. 63. And how about cotton-seed oil itself?

A. Cottonseed oil itself is used in enormous quantities for just the same purposes such as frying doughnuts, shortening bread, making pie crust and so forth.

Q. 64. As I understand it, your deposition shows that the semi-solid consistency or viscosity of the defendant's product is obtained by a mixture of glycerides which are present in preparations of radically different form from each other, to the extent that you have pointed out on this chart, is that correct?

A. That is correct, yes.

The Court: Well, now, you are introducing this evidence principally now to show that the difference was so great in the chemical composition that if the patent is construed as you say it should be, namely: substantially in accordance with the proportions of these different elements indicated in the specification, there could be no infringement, is that the point?

Mr. Pennie: That is my point, yes. That the claims sued upon although involving phraseology applicable to the defendant's processes must be construed in connection with the specification;

514 and that the actual products are different from each other. The point I have also to make is that the chemical consistency of the individual glycerides *are* the same as it was in the original cotton-seed oil. That is, in the original cotton-seed oil there was present, as there is in the defendant's product, linolin, olein and stearin, but those quantities have been so combined that the cotton-seed oil is a liquid; and in the product of the patent in suit, those same glycerides unchanged in their character are combined in the particular proportion which is inevitable to their method of production and which is essential to the existence in the plaintiff's product of a material amount of this semi-solid constituency; whereas in the defendant's product this same semi-solid constituency is produced

by a radically different combination of these same ingredients that were present in the original cotton-seed oil; and that they are not produced by any subterfuge and following out or copying the defendant's process, but that they are a necessary incident to an entirely novel process devised by Mr. Moore and practiced in the defendant's plant.

The Court: When were you people warned by the complainant that you were infringing their patent. How far had they got in the enterprise?

Mr. Pennie: The first indication they had of any sort that they were supposed to infringe upon the plaintiff's right was on February 19th, 1915; they then received a brief letter to this effect:

515 "Recently our attention has been called to your 'Kream Krisp' and as we are inclined to believe that in the manufacture and sale of this material you are infringing both our processes and product patents, we would like to discuss the matter with you with a view of ascertaining if such is the case."

That was in February.

The Court: In 1915?

Mr. Pennie: In 1915.

The Court: Had they got their plant built then or were they putting out this product in large quantities?

Mr. Pennie: Now, your Honor will recall that the patent in suit was not issued until April 13th, 1915; so that this notice really referred to the Kayser patent which had then issued and which related to the machinery for doing this and to the catalyst and the manufacture of the catalyst.

Mr. Allen: I don't think Mr. Pennie should testify in regard to that because there seems to be an opportunity.

The Court: Perhaps the inquiry is premature.

Mr. Gifford: He says in the notice, infringe both the process and the product patent.

Mr. Pennie: You had not any product patents at that time.

Mr. Gifford: We notified you that you were infringing our product.

Mr. Pennie: Not at all; that is the letter of notification. Your Honor asked me if the material was then on the market. Yes, of course, it had been on the market or our friends could not have seen it.

516 The Court: I mean in large quantities.

Mr. Pennie: In very large quantities. We will be able to show that by our witnesses.

In this connection your Honor will perhaps note from the file wrapper contents of the patent in suit, that these two claims that are sued upon are not inserted in the case until March 5th, 1915—that is after this notice.

Counsel for defendant offers in evidence copies of the specifications and drawings of patent No. 1,121,860, dated December 22nd, 1914, to Hugh K. Moore.

Marked Exhibit O.

Mr. Pennie: And also introduces in evidence as an exhibit for defendant No. 1,184,480 dated May 23rd, 1916, also to Hugh Moore.

Marked Exhibit P.

By Mr. Pennie.

Q. 65. Will you please state whether you have read the specifications of these patents in connection with the drawings and what relation these descriptions, that is, these specifications and drawings, have to the processes which you have described as used at the Berlin Mills Company?

A. I have read the specifications of the patent just referred to and find they have described the processes which I have observed at the plant of the Berlin Mills Company, and which I have just described in my recent answers.

Q. 66. Is there any rule governing the relation of the melting point and the solidification point of the fat?

A. Yes, the solidification point of a fat is always somewhat lower than the melting point.

517 Q. 67. Please explain that a little more fully?

A. The melting point of a fat is that temperature where the fat becomes liquid, in other words, where the solid portions disappear and dissolve and pass into a liquid condition. When this same fat, now in a liquid condition, is cooled it will not solidify at the temperature at which it melted, but there is a lag, as we say, it becomes super-cooled and the lower temperature must be maintained in order that the now oil will again solidify.

Q. 68. Is there any rule governing the relation of the titer of the melting point to the solidification point of the fat? And in this connection you might explain what is meant by titer?

A. By titer is meant the solidification point of the three or free fatty acids of a fat or oil. It is obtained by splitting the fat as has already been shown in the glycerine and the fatty acids; these fatty acids are then collected, melted and slowly cooled. When they have reached the temperature at which crystallization *beings* that is termed the titer.

Q. 69. Will you answer the other part of the question; is there any rule governing the relation of the titer to the melting point and the solidification point of a fat?

A. No, there is no rule governs this relationship.

Q. 70. I believe you stated that in the defendant's product, both the melting point and solidification point of the fat was higher than the titer. How is that in the product produced by the batch process?

A. The two products differ in that respect, in that in the defendant's product, the titer is always a little less than the melting point; while in the batch process the titer is above or slightly greater than the melting point.

Adjourned until Thursday, March 23rd, 1917, at ten-thirty A. M.

NEW YORK, March 23rd, 1917.
10:30 A. M.

Trial Resumed.

Mr. Pennie: In Dr. Walker's testimony given yesterday he referred to chart marked No. 401 and I desire to offer that chart in evidence. That will likewise be photo-lithographed and submitted as a part of his testimony.

I also wish to offer in evidence two physical exhibits referred to by Dr. Walker yesterday during the taking of his testimony: one being the sample of nickel oxide and asbestos ready for use in the hydrogenation vessel, or capsule, as he called it.

Marked Exhibit Q.

And also a section of the catalyser bed employed in the capsule or hydrogenation vessel.

Marked Exhibit R.

WILLIAM H. WALKER, resumes the stand.

Cross-examination.

By Mr. Gifford:

The Witness: May it please your Honor, I have abbreviated one of my answers yesterday to such an extent that I fear it is not quite clear and I would like to make some additions to it.

The Court: Yes, you may do so.

519 The Witness: In defining the titer I stated that it was that temperature at which the fatty acids commenced to crystal--ize and that is but qualitatively correct. A more exact statement is that titer is that temperature at which the heat set free by the crystal-ization of the fatty acids compensates for the heat radiated from the containing vessel while crystal-ization is taking place.

By the Court:

Q. 71. What is the effect of crystal-ization in regard to heat, what is the process? How does it bear on the question of heat?

A. When the material passes from a liquid to a solid state it always gives out heat. This is just the reverse of when it passes from a solid to a liquid, when it takes up heat. I can explain this more fully.

Q. 72. Yes, do.

A. In taking the titer, one places the fatty acids in a test tube and heats them up until they are pretty fully melted, and then places a thermometer in the center and allows the mass to cool and the heat will be radiated from the mass at a relatively constant rate, the oil producing a dropping gradiant of the temperature.

Q. 72. A dropping, or a gradiant of the temperature inside the mass?

A. Yes. When it reaches that temperature at which the liquid commences to crystal-ize, heat will be given out, it will commence to be given out on the inside of the mass, but at first it will go slower, so that there will still be a slight sinking of the temperature as read on the thermometer; in other words, the heat set free in the interior of the mass will not quite compensate for the heat radiated to the outside; when that crystallization takes place rapidly, then we
520 will generate as much heat in it as is being radiated, and the thermometer will stop falling for a moment. When crystallization is complete, again radiation will more than compensate for the generation and the temperature will continue to drop.

Q. 73. So you wish to modify your first answer, as I understand it, because you gave the point of temperature which was approximately accurate but not quite accurate?

A. That is correct.

Q. 74. In other words, what you suggested was the temperature at the point of the beginning of the crystallization rather than at a later point when its equilibrium was reached?

A. That is entirely correct, your Honor.

Cross-examination.

By Mr. Gifford:

X Q. 75. Professor Walker, you have said that you visited the defendant's plant where "Kream Krisp" was being manufactured. When, for the first?

A. In the early Fall of 1914, I should think about in September.

X Y. 76. The photographs of the plant that you exhibited here yesterday, when were they taken?

A. Last summer sometime, I think.

X Q. 77. In 1916?

A. I first saw them in the Summer of 1916; I am not quite sure when they were taken, but they represent the plant as I saw it during the Summer of 1916.

X Q. 78. How did the plant compare in size as you saw it in the Fall of 1914 with its size in 1916?

A. The hydrogenation plant proper was about the same. They did not have a very large hydrogen storage tank, nor was the can making plant in operation then.

X Q. 79. Did they have the same number of capsules?

A. As I recollect it, yes.

521 X Q. 80. And the same capsules absolutely?

A. I think so.

X Q. 81. So that you think that the capacity of the plant was the same?

A. I think it was; yes.

X Q. 82. Do you know when the plant that you saw in the Fall of 1914 was built, constructed?

A. No, I do not.

X Q. 83. You have no information on that?

A. No accurate information. It had been running quite some time before I visited it in the Fall of 1914, but I cannot say accurately for how long it had been in operation.

X Q. 84. Do you know whether they had commenced to sell "Kream Krisp" in the Fall of 1914?

A. I think they had, yes.

X Q. 85. But you don't know when they did commence?

A. No, I do not.

X Q. 86. When did you first have knowledge of the fact that Proctor & Gamble, the plaintiff in this case, had established or hydrogenized a product at their place in Cincinnati or in Ivoryvale?

A. It is very difficult to locate. But I think that when "Crisco" was first advertised, I became aware that it was a product made by hydrogenation of oils; but I cannot say when that was.

X Q. 87. Can you say whether it was before you saw the defendant's factory?

A. No, I cannot say. If I knew when they commenced to advertise "Crisco," I think I could probably locate that.

X Q. 88. You think that you know that about the time they commenced to advertise "Crisco"?

A. I state it this way: When "Crisco" was advertised, I, of course, noticed the advertisement and the material, and I think it was not long after that, that I learned that it was a hydrogenated product. Now, how long it was I really cannot say.

522 X Q. 89. How did you ascertain that fact?

A. I truly cannot tell you; I don't remember how I determined it.

X Q. 90. You don't know whether it was from reading the literature or from personal information?

A. I think it was chemical gossip, simply.

X Q. 91. It is pretty well known, is it?

A. No, I would not say that. Two of our men, Wheeler and Woodruff, I think that his name was, left the Institute upon graduation and entered the employ of a firm which was working on the hydrogenation of oils, and I am not sure but that it was in connection with the positions which these men took that I heard of hydrogenation of oils, as I think of it now.

X Q. 92. You have said that Mr. Moore came to you, I think, in the Fall of 1913, is that so?

A. That is correct.

X Q. 93. Did he mention to you the industry being carried by Proctor & Gamble at that time?

A. I have no recollection of it.

X Q. 94. In your general view of the defendant's plant, which is a part of the Defendant's Exhibit N, you represent the pipe from which the hydrogenized oil escapes from the capsule, as it is marked that is the pipe is marked hydrogenated oil, is that correct?

A. Your statement is correct.

X Q. 95. You stated, did you not, that test samples were taken

from the oil passing through this pipe from time to time, is that so?
A. That is true.
X Q. 96. Will you please state what was done with these test samples, what tests were made of them?
A. They were placed upon ice-chilled quickly and a melting point determined.
X Q. 97. How frequently were such tests taken?
A. When I saw it, quite infrequently. I should say per-
523 haps twice a day, just as I remember observing the man at work. I cannot say as to that, accurately, however.
X Q. 98. What was the object of those tests?
A. To determine the nature of the product.
X Q. 99. By its melting point?
A. By it- melting point.
X Q. 100. At about what melting point did they keep the product?
—. The information that I have in my notes is from 108 to 110 Fahrenheit.
X Q. 101. What would that be centigrade?
A. I would have to calculate from that. Mr. May has a chart which will read that off. 42 to 43, approximately, centigrade.
X Q. 102. If they found the melting point mounting higher than that, what would they do?
A. Run the oil a little faster.

By the Court:

X Q. 103. And if they found it going below that degree, what would they do?
A. Force it through a little slower.
X Q. 104. They made no change in the supply of oxygen?
A. Hydrogen?
X Q. 105. Hydrogen, I mean?
A. No.
X Q. 106. It merely absorbed less if they ran it through faster?
A. Yes.

By Mr. Gifford:

X Q. 107. You say that in those tests that determined the melting point. The first effect of cooling it would be to produce a solidification point, would it not?
A. That is true, yes.
X Q. 108. Why didn't they take the solidification point instead of the melting point?
A. It is much easier to cool quickly by placing it upon a
524 cake of ice, from which you can fill a tube of this solid material, and then observe its melting point.
X Q. 109. In your observation of the defendant's process, did they keep the melting point very closely at the figures you have given?

A. I did not observe that particularly when I was there; but my impression is that they do.

X Q. 110. When was it that you observed the process, about which you have testified?

A. November, 1916, I made my closest study.

X Q. 111. Were you there for a great length of time?

A. Yes, I was there for two days although I was not at the hydrogenation plant all the time.

X Q. 112. You were only in a position to observe these tests for about how long?

A. I stayed at that particular part of the plant possibly not longer than fifteen minutes; long enough to observe the operation of the apparatus.

X Q. 113. How is it to be accounted for that in your opinion that in specimens of "Kream Krisp" as obtained on the market, that the melting point is lower than what you have given?

A. They must have operated at a rate to produce a temperature lower than the one that I specified as being the desirable one.

X Q. 114. That is, they must have operated so that their tests would show the melting point for the "Kream Krisp" as it is found on the market?

A. Assuming that the same method of obtaining the melting point was employed.

X Q. 115. Do you know why it is that the defendants exercise so much care to keep the melting point down to a point or the point that you have indicated?

A. Uniformity of product is always highly desirable in any commercial article of manufacture.

525 X Q. 116. Why do you understand that they did not adopt a higher melting point for their tests, what would be the objection?

A. I don't know that there would be any material objection; presumably they adopted that point, for the melting point which gives them a product which they thought was most desirable.

X Q. 117. And what would be the effect of running the apparatus with such a slower flow of oil as would produce a very much larger melting point?

A. It would shut down the production per unit for the particular apparatus, which, of course, is very undesirable in any manufacturing process.

X Q. 118. What effect would it have on the product?

A. Running it slower would give you a higher melting point.

X Q. 119. And what would be the difference in the physical characteristics of the product?

A. As the melting point rises the material is harder at ordinary temperatures.

X Q. 120. If the melting point were high enough as shown by those tests, would the product approximate in hardness this specimen, Plaintiff's Exhibit No. 3?

A. I cannot say that from any experience. I do not see why, if the

melting point was not sufficiently high one could not operate to produce any desired hardness; but I cannot say from experience.

X Q. 121. So that if the defendant's apparatus were run on the basis of tests showing the melting point of say 60 Centigrade for aught you know this product, Plaintiff's Exhibit No. 3, would be produced, so far as physical appearance is concerned?

A. So far as I know the process might be run slowly enough to produce a product of that melting point. It would of course cut down the production of a given plant very materially?

526 X Q. 122. Is it true, therefore, that in operating their process, the defendants keep the hydrogenation down to a point which produces the lard-like product that they want to get?

A. They produce a product which they want to get by controlling the hydrogenation; but I have never seen any that I would call "lard-like."

X Q. 123. But used as a substitute for lard?

A. Yes.

X Q. 124. Would it be correct to say, then, that in defendant's processes, the cottonseed oil is caused to absorb a limited amount of hydrogen by reacting on the oil with hydrogen in the presence of a catalytic agent and at an elevated temperature?

A. It would be more accurate to say that a portion of the cottonseed oil was made to react with hydrogen at an elevated temperature because of course there is a relatively large portion of the oil which passes through the capsule and is not acted on by the hydrogen at all.

X Q. 125. How do you know that fact?

A. Because in the oil we have approximately 22 per cent. stearin which cannot be acted on by hydrogen; we have in the final product some 34 per cent. of linolin which has not been acted on by hydrogen. We have in the final product about 33 or 34 per cent. of olein which may not have been acted on by hydrogen at all. So that the only percentage of the oil which has really been acted on by hydrogen is not more than 14 or 15 per cent.

X Q. 126. Excepting in percentages, the same would be true as to the Batch method I suppose.

A. The same general statement would hold for that method, yes, other than the percentages named.

X Q. 127. What is the elevated temperature at which the
527 hydrogenation takes place in defendant's capsule?

A. Referring to my notes the temperature in the capsule is at 350 degrees Fahrenheit.

X Q. 128. And that would be what Centigrade?

By the Court:

X Q. 129. That is in the defendant's?

A. In the defendant's.

Mr. Gifford: The reason I asked for Centigrade, your Honor, is because there are so many of them given in Centigrade.

A. About 170 degrees Centigrade.

By Mr. Gifford:

X Q. 130. How much do you suppose that varies in practice?

A. I do not know from observation, but my opinion is not much.

X Q. 131. Do you think it would run from 160 to 180?

A. I think they could keep a closer range than that because the hydrogen is electrically heated, that is heated by passage through pipes which are electrically heated, and therefore under very accurate control. I would say that they could keep it within ten degrees.

X Q. 132. I notice that in the Moore Patent, that you have referred to in your direct examination No. 1,121,860, it says "For edible fats a temperature of 300 to 350 F. may be used, although a much lower temperature may be maintained if desired."

Do you consider this statement to be true of Defendant's process?

A. I think that is a fair statement; I know of no reason why it is not entirely true.

528 X Q. 133. I find in the context of that statement in the same Moore patent the following:

"I find that it is desirable that the temperature within the compartment 19 of the casing shall be approximately 475 degrees to 480 degrees F. in making soap stock, although of course this may vary."

Q. What would those temperatures be in Centigrade?

A. About 250 degrees Centigrade.

X Q. 134. The two quotations that I have made from this Moore patent use the expressions "soap stock" and "edible fats." What do you understand to be the distinction between these two things?

A. There is of necessity no distincton between a food stock and a soap stock in the sense that any fat or oil which can be used for food can also be used for soap. Conversely, any stock used for soap can also be used for food unless it be contaminated by some extraneous material which makes it objectionable or non palatable. There is no difference, so far as the glycerids are concerned, in the two materials because all glycerids if uncontaminated may be used as food stock; and all glycerids also may be used for soap stock.

X Q. 135. And what do you understand this Moore patent to use these two terms in contradistinction to each other for?

A. The much higher temperature, namely, 250 degrees Centigrade, at which Moore suggests the operation may be carried on if only soap stock is desired, means that the reaction, as one would naturally expect, is more rapid at that elevated temperature; but there will be introduced an undesirable flavor, and I should think possibly also color, which if for soap stock would be of no significance, but

529 which for a food product might make it and I think would make it less palatable, and therefore less attractive.

X Q. 136. Do you think there is any physical difference between what he intended by the term "soap stock" and what he intended by the term "edible fats"?

A. I see no reason why he should make a distinction.

The Court: That Moore patent is what?

Mr. Gifford: The one that they introduced as being a patent of the defendant's apparatus or process.

The Court: Well, do you deny that it is?

Mr. Gifford: No.

The Court: It is your patent?

Mr. Gifford: It is not our patent, it is their patent. It is the patent that the defendants operate under, operate their process under.

The Court: That has not been considered at all, before, has it; I mean in the testimony or argument, to amount to anything?

Mr. Gifford: That is to be considered as the patent on the defendant's process, yes.

Mr. May: Those patents were entered, if your Honor please, so that there might be in some concrete form a description of the process and apparatus under which the defendant acted; they describe briefly and substantially the same apparatus that Dr. Walker described yesterday, and were put in for that purpose. Dr. Walker also referred yesterday to those two patents as showing the processes and the apparatus.

The Court: It does not distinguish here between the use
530 to which this product is to be put in the Moore patent, I mean it gives the same formula whether it is to be used for soap or food purposes.

Mr. Gifford: This does not purport to make a distinction as to the formula.

The Court: It is your point, that it does not make any difference?

Mr. Gifford: It gives a different temperature for the soap stock and the edible stock; it makes a distinction in temperature.

X Q. 137. In describing your diagram of the defendant's plant, you said that the Fuller's Earth was normally used in it, referring to the tank marked Fuller's Earth treatment. What did you mean by that?

A. Fuller's Earth is used in ordinary refining of oil, to remove the color, or at least as much as is possible from the oil. The Fuller's Earth itself which is used in this tank, I meant to be understood as being normal Fuller's Earth—ordinary Fuller's Earth used for the purpose.

X Q. 138. And that has been so for many years past, as I suppose?

A. Yes.

X Q. 139. Long before any of the matters here in controversy?

A. I think that is true.

X Q. 140. And in the same sense would you say that the filter-press in defendant's apparatus is normally used?

A. Yes, that is a standard piece of chemical engineering apparatus.

X Q. 141. And in the same sense would you say that the deodorizer is normally used?

A. Yes, I would.

X Q. 142. And in the same sense would you say that the chilling roll and what I think you have called the picker is normally used?

A. That is true. I would not be understood, however, as
531 indicating that these pieces of apparatus are so used as is commonly the case, because there may be some improvement in the method of operation and design which the Berlin Mills Company have introduced; but as typical pieces of apparatus for the purpose for which they are used I think it is only right and safe to say that they are common engineering pieces of machinery.

X Q. 143. And have been common for perhaps ten or twenty years?

A. Ten, probably; but I do not know about twenty.

X Q. 144. You spoke of the chill roll and picker as preventing segregation, I think. What do you mean by that?

A. The chill roll prevents segregation, in that the oil is chilled so rapidly that there is no chance for the stearin to separate from the liquid constituents as would be the case if they were allowed to cool slowly. The picker has nothing to do with segregation, but is a machine used to beat up and render light the material; which is accomplished by forcing or enclosing very small air bubbles in it.

X Q. 145. Is the use to which they are applied the well known use of corresponding apparatus in the treatment of animal lard as you understand it?

A. I think, so, yes.

X Q. 146. In answer to Q. 21 you have said that the summer cotton-seed oil used for food purposes was refined so as to be palatable. Was that true of the winter oil used for food?

A. Yes, sir

X Q. 147. So that for food purposes the cottonseed oil was always refined, as I understand it?

A. I think that is the case. When the oil is pressed from the cottonseed it contains a certain amount of mucilaginous and albuminous material which it is desired to remove. This is done by
532 what is known as the process of refining. It is a food product, however, so far as being digestible and nutritious is concerned before refining: but refining adds very much to its palatability.

X Q. 148. In answer to Q. 35 you have stated that in defendant's process while passing through the capsule, the cottonseed oil acquires some color, at least the oil itself is slightly colored, that is the hydrogenated oil has more color than is commercially desirable. What is this coloring substance?

A. A part of the coloring substance in the finished oil is due to an iron soap, very small, to be sure, but still a function of the amount of iron with which the oil becomes contaminated, if you may so use the word "contaminated." The other portion of the color matter is that indigenous to oil, the composition of which I have not the slightest idea.

X Q. 149. It is some substance, the composition of which is unknown?

A. So far as I am concerned it is unknown.

X Q. 150. In refining cottonseed oil are there other ingredients beside linolin, olein and stearin?

A. Yes, under stearin we include the other common saturated fats palmitin; and under linolin we include the small amounts of fats of less saturation than has linolin. These, however, are small in amount and are, in practice, always grouped as linolin.

X Q. 151. Are there no other substances?

A. There may be in small amounts, I do not know what they are.

X Q. 152. In your opinion do you think there are other substances or not?

A. In ordinary cottonseed oil there must be the small amount of color-giving material which we detect in what is known as the Halphen test, provided that oil has not been heated to such a point where this material is decomposed.

533 X Q. 153. Do you know what the substance is?

A. No, I do not.

X Q. 154. Do you know whether there are any other substances in refined cottonseed oil besides those that you have mentioned?

A. No, I do not.

X Q. 155. So far as you know there may be, however?

A. There may be and probably are traces. In fact in natural products produced as cottonseed oil is, they all contain traces of a great many other compounds, but they are so slight as to be of no consequence whatever in treating the chemical constituents of oil.

X Q. 156. In the hydrogenized cottonseed oil, are there any other substances besides those that you have mentioned?

A. I would expect the same traces of those indeterminate bodies which I believe always are associated with natural products (made from Nature) to be in the hydrogenized oil.

X Q. 157. Do you know whether they are affected in the hydrogenizing?

A. I don't know positively, no; it depends upon what you mean by hydrogenizing. The material which gives the Halphen test is not materially affected when passing through the hydrogenization process as carried on at the Berlin Mills, because I have seen samples of the hydrogenized product which gave the Halphen test very clearly and distinctly.

X Q. 158. But as to the effect of the hydrogenizing upon this and the other possible ingredients, very little is known, I suppose?

A. Very little is known; in fact, so far as I am aware, nothing is known; but my impression is from the knowledge of organic chemistry which I have, that no change of any material nature takes place because it is not observed in the finished product.

X Q. 159. If you were to take the proportions of linolin, olein and stearin and perhaps palmitin that exists in cottonseed oil
534 and make them separately and then mix them together, would you get cottonseed oil?

A. For all purposes for which cottonseed oil is used I think you would.

X Q. 160. But would you get the cotton-seed oil chemically?

A. In the last analysis, no; because these indefinite small quantities of other constituents would not be present.

X Q. 161. Well, would the glycerids that you made separately and put together be chemically in the same relation to each other as they are in cottonseed oil?

A. If you put them together in that relationship, of course they would be there.

X Q. 162. No, I mean if you simply mixed them together would they be in that relationship?

A. I fear I don't quite understand your meaning: If one made the glycerids and mixed them in the proportion in which they exist in cotton-seed oil, they would then be chemically in the same condition as in cotton-seed oil; yes.

X Q. 163. Is glycerid of stearic acid a component of hydrogenized cotton-seed oil?

A. It must be because it is a component of the oil before it has been hydrogenated and hydrogenizing does not influence or change the stearic acid molecule.

X Q. 164. You say that glycerid of stearic acid is a component of unhydrogenized cotton-seed oil?

A. It may be; I am not sure whether one could obtain from ordinary cotton-seed oil the tri-glycerid of stearic acid or not. I would be surprised if we could not.

X Q. 165. Don't you know that the authorities have said that it is not a component of cotton-seed oil?

A. No; I don't know that and I would be very slow to believe it I saw it, because the methods of obtaining it and dissecting these glycerids are so imperfect, that I would not be willing to be-
535 lieve anyone's statement that it did not exist because it is very possible that there is not any method of obtaining it as yet that has been evolved.

X Q. 166. You have referred, I think, to Dr. Lewkowitsch as an authority and I read the following from page 157 of his book, Volume 2, 1909 Edition:

"Thus Hebner and Mitchell found in the sample of cotton-seed stearin 3.3 per cent. of stearic acid. Reecnt observations by the author have shown that it is doubtful whether stearic acid does occur in cotton-seed oil, inasmuch as it was found that the mixed cotton-seed fatty acids are capable of dissolving 5 or more per cent. of stearic acid, without being possible to detect the presence of the added stearic acid with the aid of the Hebner and Mitchell test. According to Victor J. Meyer, the stearic acid found by this method is most likely archidic acid or a mixture of palmitic and archidic acids since Meyer was unable to detect stearic acid in the methylesters of the cotton-seed oil fatty acids when subjecting them to the fractional distillation according to Haller's method."

Are you in agreement or disagreement with that quotation?

A. I have the highest respect for Dr. Lewkowitsch and his work, but I cannot disagree with the statement as read because I have not sufficient information. On the other hand I would not think of agreeing with it, because it is so complex and the material with

which it is concerned is so complex, that it may be very possible that there are, and that further investigation would prove that there is stearic acid present. In any case the palmitic acid would
536 be saturated acid which I have always included under the word stearic acid, as mentioned, when I started by deposition because such is the common practice; and I remember when the patent in suit was read, that the patentee personally uses that same convention.

X Q. 167. In your last answer you have used the expression "complex substance," to what substance do you refer?

A. This mixture of materials which the investigators were concerned with.

X Q. 168. Now, in your explanation as to the iodin number and the double bonds, you stated, as I understand you, that there were two double bonds in linolin, one double bond in olein and no double bond in stearin. Is that correct?

A. That is my understanding of it, yes.

X Q. 169. And that the iodin number was great with respect to linolin because linolin having two double bonds would take up more iodin when presented to it?

A. I think that is correct, yes.

X Q. 170. How would that be as to oxygen if presented to it in place of the iodin?

A. The reactions which take place with these double bonded molecules and oxygen *and* are exceedingly complex, and I am utterly unable to give any statement as to the rapidiy with which the reaction could be carried on when measured by the double bonds in the molecules present. The reaction with iodin is a perfectly definite one while the reaction with oxygen is entirely an indefinite one.

X Q. 171. You are not prepared to say, however, are you, that more oxygen is taken up by the two double bonds than by either the single double bond or by no double bond?

A. No, I would not say that, in fact I think probably it is the reverse.

537 X Q. 172. You thnk that probably there is more oxygen taken up by linolin, then, than by either olein or stearin?

A. I would expect that to be the case.

X Q. 173. So that to the extent that the defendant's process transforms the linolin into the other substances, olein and stearin, to that extent the product is rendered immune from oxidation?

A. Assuming that the absence of the double bond is really material in preventing oxidation, that is true; I would not be understood, however, in stating that the chief function of changing of linolin into stearin was that it might absorb less oxygen. This is incidental rather than intentional.

X Q. 174. And your opinion is, isn't it, that in the defendant's product as compared with the cotton-seed oil from which it is hydrogenized, there is less tendency to oxidation because there is less linolin?

A. Probably that is true, in fact, and yet it may be so slight as not to be noticeable in practice. I am not prepared to say that the

defendant's product would oxidize materially less rapidly than the cotton-seed oil from which it was made.

X Q. 175. But you are not prepared to say the contrary?

A. No, I am not.

X Q. 176. You have given the percentages of acid from the figures. It is true, is it not, that defendant's "Kream Krisp" is lower in percentage of linolin than the cotton-seed oil from which it is produced? And higher in percentage of olein?

A. Referring to chart 401, it is seen that the linolin is less than in the cotton-seed oil. The olein is slightly, though very slightly, greater.

X Q. 177. And is it also true that there is sufficient stearin in defendant's "Kream Krisp," to make it congealed or solid at ordinary temperatures?

538 A. "Kream Krisp," at least at ordinary temperatures, congeals, but of course, "solid" is relative. I have never seen any "Kream Krisp" that I would speak of as being solid.

X Q. 178. Well, omitting the word "solid" from the last question that is so, as I understand you?

A. I think so.

X Q. 179. Now, in order to get the percentages in that answer I would like to have you state the percentages of the various ingredients in "Kream Krisp" and in the cotton-seed oil from which it is obtained?

A. To which answer are you referring?

X Q. 180. To which answer of yours?

A. Yes. Do you refer to an answer which I made to your question? I don't catch it.

X Q. 181. No, I do not. I was merely asking you to re-state the percentages in "Kream Krisp" and the corresponding percentages in the cotton-seed oil from which it is obtained?

A. The cotton-seed oil, of course, varies somewhat, but taking an average, which I think we have on chart 401, it is: Stearin 22, olein 32 and linolin 46 (I think I am right on this). After hydrogenation, as represented by the last sample of "Kream Krisp" which was stipulated in the case, the analysis as given me by the laboratory of the Berlin Mills Company is: Stearin 28, olein 34.3 and linolin 37.7.

X Q. 182. In your experience have you found that these percentages vary considerably as between different specimens of "Kream Krisp," the defendant's product?

A. No, not a great deal. The percentages of "Kream Krisp" can be given in very general numbers as about 33 1-3 per cent. of each.

X Q. 183. You say about 33 per cent. each; do you mean that you have seen specimens of "Kream Krisp" that had 33 per cent. of stearin?

539 A. I do not know that I have seen specimens, but I have seen analyses of "Kream Krisp" in which the stearin was as high as 33 per cent.

X Q. 184. And how low in stearin have you seen analyses?

A. I do not recall any lower than the ones which I have just given.

X Q. 185. Not lower than 28?

A. I do not recall any.

X Q. 186. How high in stearin have you seen analyses of "Kream Krisp"?

A. I do not remember at this moment of having seen an analysis higher than 33, or possibly 34.

X Q. 187. How high and how low in olein have you seen analyses of "Kream Krisp"?

A. The olein would not, of course, be lower than the olein of the oil, because the linolin is so much more easily attacked than the olein that the tendency is to build olein up rather than drag it down. I have an analysis which I made myself in which the olein was 35 per cent. I do not now recall having seen an analysis higher than that.

X Q. 188. What is the lowest in olein that you have seen analysis of "Kream Krisp"?

A. Purely from recollection, I do not remember of seeing it lower than possibly 31 or 32; directly in that range.

X Q. 189. Are you certain that you ever saw any as low as that?

A. No; I am not.

X Q. 190. What is the lowest that you are certain of having seen?

A. The lowest that I am certain of having seen is the one given 34.3.

X Q. 191. What is the highest and lowest in percentage of linolin that you have seen in an analysis of "Kream Krisp"?

A. The lowest that I am positive of is my own analysis, 33.2 and I do not at this time recall of seeing one higher than the analysis given; 37.7 although I would like to have it understood
340 that this is purely my recollection and should be verified by consulting notes.

X Q. 192. In Defendant's Exhibit M have you ascertained the melting point of the various specimens, of which there are six?

A. No; I have not.

X Q. 193. You have not applied any test to specimen No. 6 of this exhibit to ascertain its degree of hydrogenization?

A. No; I have not.

X Q. 194. Are you of the opinion that the statement that a cottonseed oil contains 17 per cent. saturated fats, 37 per cent. linolin and 46 per cent. olein is an error?

A. I am, yes.

X Q. 195. Why do you conclude that it is an error?

A. Because to get those proportions one must have an iodin number of the oil and liquid fatty acids which is beyond that which I have ever observed or have ever seen noted for cottonseed oil.

X Q. 196. It would have been an obvious error, I suppose, to anybody familiar with the subject?

A. To anyone who had made their calculations.

X Q. 197. At what temperatures do the solids crystallize out of cottonseed oil?

A. One could not answer that question without knowing the cottonseed oil, because the temperatures at which the solids would appear would depend not only upon the amount of solids present, but also

on the relative amount of olein and linolin present, because the solids are held in the oil dissolved as a liquid not because of their melting points, but because they are in solution; so that as the solvent changes, the temperature at which they would commence to crystallize would also change.

Let me add that I have seen cottonseed oil in which the solids appeared at ordinary room temperature.

X Q. 198. I have already asked you as to the cause of
541 the coloring by hydrogenizing cottonseed oil in defendant's process. I believe you said that the hydrozenation imparted odor to it also, did you?

A. I think that is true; yes.

X Q. 199. What substance gives this odor?

A. I am not so sure that it is the hydrozenation itself that imparts the odor as much as the Fuller's earth which follows, when I come to think about it. The process of decolorizing with Fuller's earth adds an odor to the oil; just what that is due to I do not know.

X Q. 200. You do not know whether it is some ingredient of the oil that the Fuller's earth acts on or whether it is the odor of the Fuller's earth itself.

A. No; I can not tell you.

X Q. 201. In the course of your direct testimony, questions 12 13 and so forth, the expression "ordinary temperature" was used. What do you understand to be ordinary temperature?

A. Ordinary temperature, of course, is purely relative. May I see the answer?

X Q. 202. Yes, here it is.

A. I was here speaking of ordinary temperature in the sense of living temperature in a comfortable room. I should say 70 degrees Fahrenheit was some ordinary temperature.

X Q. 203. What would that be Centigrade?

A. 21 Centigrade.

X Q. 204. You have stated that cottonseed oil is used to a considerable extent in cooking. If that is so why is it desirable to hydrogenize it?

A. The chief reason, so far as I can see, is to satisfy the cook. I have had a good many cooks tell me that they would as soon use and did use cottonseed oil in preference to lard or any of the commercial compounds, but it is not so easy to handle because it is a liquid
542 and in stirring it in the flour it requires greater dexterity. So far as the food value is concerned, however, there is no difference and so far as the product is concerned, if well done, I believe there is no difference whatever.

X Q. 205. If well done you say?

A. Manual dexterity; the cleverness with which the oil is mixed with the flour so that it will not segregate.

X Q. 206. Do you think there is any less dexterity required in the mixing of "Kream Krisp" than in the mixing of oil to secure good results?

A. Yes, I think there is.

X Q. 207. Why is that?

A. Because if the oil is not carefully mixed in the sense of having it finely distributed through the flour it is liable to segregate and make soggy spots, but if on the other hand one takes a small amount of flour and mixes that with the oil very carefully and completely and then mixes that oily flour, let us say, with more flour, as a druggist does in making compounds, he will then get a perfect mixture in which there will be practically no segregation.

X Q. 208. That would be rather beyond the capacity of the ordinary cook, would it not?

A. No; I would not think so. It is not so easy and cooks like everyone else take the line of least resistence, but it is not beyond their capacity.

X Q. 209. If that precaution were not taken by the cook, what would be the effect on the product, do you think?

A. There again it is purely a question of degree. If one took no precaution and dumped it in, the oil would all segregate to the bottom. If you take reasonable precautions it would be pretty good. If he took the precautions I have outlined it would be excellent.

X. Q. 210. If he only took half precaution and it did not
543 go to the bottom but was segregated around the different parts. What would be the effect on the product?

A. The question is so indefinite that of course it is very difficult to make an intelligent answer. But if the fat or oil is finely distributed through the flour, even when it is heated so that everything becomes liquid, whether it be fat or oil to start with, it will not segregate; it will stay finely distributed through the mass, but if, on the other hand, when mixing the oil with the flour, one permits a little ball of soggy oily dough to exist, that will remain in little balls of soggy dough and will give a greasy spot in the cooking

X Q. 211. And if it was very poorly mixed and went to the bottom, I suppose that it would have all grease at the bottom of the product?

A. I can scarcely conceive of any cook being so slovenly as to perform an operation of that kind, but if she did, that is what she would get.

X Q. 212. Now, returning to the defendant's process before which was called to your attention, had you any knowledge of the processes known in the art of hydrogenizing cottonseed oil?

A. Yes; before the fall of 1913, I had heard of hydrogenating oil, although I can not definitely tell you where or how. But when Mr. Moore spoke about his interest in the subject it was not a new one to me.

X Q. 213. Do you know of any process of hydrogenizing oil antedating the Moore process in which the cottonseed oil was atomized by the hydrogen?

A. No; I do not think I do.

X Q. 214. You did not know of what has been introduced in evidence here by the defendant as the Erdmann patent?

A. No; I did not.

X Q. 215. Did you know at that time of any process that had

been used which was a continuous process as distinguished
544 from a Batch process?

A. No; I think I did not know of any process in detail. I knew simply of the chemical reaction which was brought about and that metallic nickel acted as the superior catalyst for the reaction. The details of the process I did not interest myself in.

X Q. 216. You did not know of the Bedford and Williams continuous process?

A. No.

X Q. 217. So that you have not undertaken to testify as to the amount of novelty that was displayed by the defendant's process in comparison with the prior art?

A. No.

X Q. 218. In the defendant's process oil is sprayed by the hydrogen on to a sector of the diaphragm by a nozzle which continually revolves. Do you mean to be understood as saying that the only hydrogenizing that is taking place in that operation is directly in the spray, in the sector upon which the spray is directed for the time being?

A. No; because the oil is not instantly driven through the bed of the catalyser the moment that the spray strikes the bottom. There doubtless is a lag after the sector itself has passed over a definite point of the diaphragm before it is entirely removed by the rush of hydrogen through the diaphragm.

X. Q. 219. Have you any means of knowing what that lag is in time?

A. No; I have not.

X Q. 220. Have you ever looked into the capsule to see what was the appearance of the diaphragm outside of that for the time being zone?

A. Not when it was in operation; no. I think the diaphragms are not equipped to observe them when the door is shut and the high pressure exists within the capsule.

545 X Q. 221. I rather got the impression from your direct testimony that the oil in the portions of the diaphragm outside there, for the time being zone, was simply blown through so as to clear the catalyst of oil?

A. You are correct.

X Q. 222. But not knowing the amount of lag of the oil there, how can you say it is simply blown through?

A. Because of the results obtained. If one does not take the precaution to cover only a portion of the diaphragm and allow the hydrogen to come in close contact with the nickel, one does not get the rapid hydrogenation which results.

X Q. 223. Do you think that there is any different kind of action so far as hydrogenation is concerned going on in the for the time being zone of the spray and the parts of the diaphragm outside of the zone?

A. No; I rather think that the hydrogenation which takes place does so the moment that the oil strikes the surface of the nickel and uses up the hydrogen which is absorbed on the nickel or which is

there in the form of the unstable hydrides and that the oil which passes through after that goes through without reaction.

X Q. 224. But that is merely a theory, is it not?

A. That is a theory based on the fact that we have so much oil in the resultant product which has not been affected by the hydrogen.

X Q. 225. You mean you have so much of the linolin?

A. Yes; and also stearin.

X Q. 226. But by slowing the flow of oil you can increase the amount of glycerids that are affected by the hydrogen?

A. Yes; that is logical because the relative amount of the oil which is affected by the hydrogen on the nickel to that which follows later and is not affected is therefore greater, and therefore you would have in the resultant product a greater percentage of the
546 products of the reaction.

X. Q. 227. Generally speaking, the catalytic action requires a certain amount of time, does it not?

A. No; I do not think that is so. I think that it is pretty nearly instantaneous at the one point. Of course one must constantly bring about this triple contact that I have already described, but once those three things come into contact I have no reason for thinking that the reaction at that point is not instantaneous.

X Q. 228. Now, in consequence of the lag of this oil in going through the diaphragm, there must be considerable oil deposited on and in the diaphragm by the spray which has not gone through while the spray is on that sector; must not that be so?

A. I do not know that that follows.

X Q. 229. But you do not know that it does not follow?

A. No; I do not as I have already stated, I do not know just how much that lag is; in fact, I do not know positively that there is any lag; it may go through instantly.

X Q. 230. But that would not be reasonable, would it?

A. It would depend on the velocity of the hydrogen passing through the diaphragm. I can conceive of such a velocity; I believe it can be produced.

X Q. 231. But the hydrogen passing through the diaphragm which has the greater velocity is the hydrogen passing through the zones that are outside of the spray; is not that so?

A. Yes; although I do not know why the velocity should be materially cut down where the spray exists if there were sufficient difference in pressure above and below the diaphragm.

X Q. 232. It seems to me that there is very little reason in what you have stated for supposing that the hydrogenizing of the
547 oil is any greater in the for the time being zone of spray if as great as it is in the other zones of the diaphragm. Have you any further reasons to advance? If so, I would be glad to have you do so?

A. I fear I have not made myself clear. The triple contact which we must obtain in order that reaction may take place is that of nickel hydrogen and the oil. When the nickel is covered with a film of oil it is difficult for the hydrogen to reach the nickel. Therefore, if we have a structure such that hydrogen can rush through it it will drag off oil from the nickel and give that hydrogen a chance to be ab-

sorbed on the nickel, or to form this unstable compound of nickel and hydrogen. Then, when the next drop of oil strikes it instantly there will be a reaction because then we have the hydrogen already on the nickel, and the moment that the film of oil comes on the hydrogen and nickel, we have reaction. After that the reaction will be slow, if at all, until again the hydrogen is allowed to come in direct contact with the nickel.

In the Batch process, reaction takes place slowly because the hydrogen forces itself through the film of oil as the entire mass is agitated, while if one can split up the film of oil the absorption of hydrogen is very rapid. Therefore, the greatest rate of hydrogenation must obtain in defendant's process when the oil first strikes the new, or we might say, dry portion of the catalyser and that after that until it has been all passed through reaction is very slow if there is any at all. That seems logical to me.

X Q. 233. The hydrogen which makes the spray is under what pressure?

A. 100 pounds.

X Q. 234 And the hydrogen which does not make the
548 spray, but which comes into the capsule outside of the for the time being spray zone is under what pressure?

A. Not much less; the pressure on the top of the diaphragm is ninety pounds, a difference of ten pounds.

X Q. 235. The hydrogen making the spray has the greater pressure?

A. Yes; is the greater.

X Q. 236. Now, in defendant's product "Kream Krisp" how much less is the titer than the melt?

A. I have not those figures very distinctly in mind, but I think about three or four degrees; possibly five degrees.

X Q. 237. Do you think that makes any practical difference?

A. Practical from what point of view, please?

X Q. 238. From the point of view of the use of the product.

A. No; I do not believe the ratio or relationship between the titer and the melting point has anything to do with its use in cooking or in its digestion.

X Q. 239. Do you know whether the titer in the product of the Batch process is varied by a difference in time or temperature or pressure?

A. One cannot vary all three things and get any results. If you vary three things at a time you can get no relationship between them.

X Q. 240. I say or time temperature or pressure?

A. If one maintains the time and the temperature constant and varies the pressure one will get a different titer. The titer will differ but whether the ratio of titer to melting point will differ materially I do not know.

X Q. 241. Do you know how much oil goes through the defendant's diaphragm in the fraction of a second?

A. One can calculate it. When they start the flow is be-
549 tween five hundred and six hundred pounds per hour. Calling it 550 you can easily calculate the weight per second.

X Q. 242. Do you know what is the difference in pressure above and below the defendant's diaphragm?

A. Yes; when the diaphragm is new the pressure below the diaphragm is about sixty pounds. It gradually drops, but I am unable to say what the pressure is when the diaphragm is removed and a new one replaced.

X Q. 243. Have you ever examined the diaphragm in defendant's apparatus after the operation was over?

A. I never have; no.

X Q. 244. You do not know how much oil there is left in or on top at a time?

A. No; I do not.

X Q. 245. I think you have spoken somewhere of dry spots in the diaphragm.

A. Yes; possibly.

X Q. 246. You never observed the diaphragm to see whether there are any dry spots?

A. No, but just as before realizing the enormous rapidity with which the reaction takes place and therefore the amount of hydrogen which must be on the nickel I make the assumption that in so far as the film of oil is concerned it must be practically absent and therefore it would look dry. Possibly that is a misuse of the word "dry," but that is my thought.

X Q. 247. What is the temperature of the deodorizing vessel that you have referred to in defendant's plant?

A. The steam in the heating coils is kept at about one hundred pounds so that if one had the steam tables one could obtain the temperature of the coils. The steam is superheated to 600 degrees Fahrenheit at the superheater, but the oil in the tank while the process of deodorization is taking place is 270 degrees Fahrenheit.

X Q. 248. Can you not give the temperature inside the deodorizer?

A. Yes; 275 degrees.

550 X Q. 249. You have referred, if I remember correctly, to two men having left you and gone into the hydrogenizing business; was that correct?

A. That is right, yes.

X Q. 250. Who were they?

A. Mr. Wheeler and I think Mr. Woodruff, although I am not sure of the last name, it is either Woodruff or Woodward.

X Q. 251. Do you know what hydrogenizing business they went into?

A. No.

X Q. 252. When did they leave you?

A. I can look that up for you in the Institute Catalog, but time goes so rapidly I really cannot say. At a guess five years ago.

X Q. 253. That would be 1912?

A. That would be a guess. I would rather withdraw that answer and furnish you the information if you so desire.

Redirect examination.

By Mr. Pennie:

R. D. Q. 254. You have been asked as to the relative efficiency as between cottonseed oil in the hands of the cook and of defendant's "Kream Crisp." Will you please state whether that relative efficiency is likewise predicable upon any other food product of the same consistency as "Kream Crisp"?

A. Yes; my remarks would apply to any material of that consistency such as the lard compound of lard itself.

R. D. Q. 255. One of the questions asked you ted you to answer that in your view the defendant's "Kream Krisp" could not be characterized as lard-like, would you please explain in what respect it is not lard-like as you view it?

A. I am familiar with lard as having made it when I was a boy on the farm and having seen it as of a snow white product and no "Kream Crisp" that I have ever seen has anything like the whiteness, nor does it have the apparent texture, so I would not
551 say it looked like lard or is lard-like. I have never seen any Kream Krisp that smelled like lard or anything that tasted like lard.

R. D. Q. 256. What would you say as to its composition in so far as linolin is concerned?

A. It has much more linolin than lard has.

R. D. Q. 257. Can you state relatively the amount of linolin in the defendant's "Kream Krisp" and in lard?

A. No; I cannot at present, because I find I have not got the lard on my notes and I cannot hold those figures in my mind.

R. D. Q. 258. I hand you a photograph and will ask you what it is?

A. This is a photograph taken of the spray nozzle in the capsule with the manhole open showing the spray of oil that is distributed by the blast of hydrogen which meets it. There was, of course, no pressure in the capsule at this time because the manhole was open in order to take the photograph.

Mr. Pennie: The photograph produced by the witness is offered in evidence.

Marked Defendant's Exhibit S.

WILLIAM D. RICHARDSON, a witness called on behalf of the defendant, being duly sworn, testified as follows:

Direct examination.

By Mr. Pennie:

Q. 1. What is your name?
A. William D. Richardson.
Q. 2. Your age?

552 Mr. Kerr: If the Court please, there is a rule here with regard to the number of experts.

The Court: Is this man an expert?

Mr. Pennie: I am calling Dr. Richardson because he is familiar with lard. The last witness said he was not familiar with lard.

The Court: Only on that one point; we cannot have more than one expert here. This has been a very full exposition by your former expert, I think. If there is anything which he has not covered at all, why, you may go into it; but I do not want repetition.

Mr. Pennie: No; I wish to show by the witness the character and nature of lard and lard compounds. The witness is particularly familiar with these matters, as matters of fact and not as matters of expert opinion. I have no matters of expert opinion to ask him.

Mr. Kerr: I understand that excludes his comparison of such things.

The Court: I do not know what he is going to offer. I will have to pass on that when I know.

Q. 3. What is your residence?

A. Chicago, Illinois.

Q. 4. Your occupation?

A. Chief chemist for Swift & Company in their Chicago plant.

Q. 5. Does Swift & Company manufacture soap?

A. They do.

Q. 6. And food products?

A. Yes.

Q. 7. Do they manufacture them from oils?

A. They manufacture them from animal oils and fats, animal, vegetable oils and fats.

553 Q. 8. Is there any difference between the animal and vegetable oils which are used for making soap on the one hand and for making food products on the other?

A. There is no essential difference between the oils used for the two lines of manufacture.

Q. 9. Do they differ as to edibility?

A. For the higher class of soaps, oils and fats are used which might well be used in edible products.

Q. 10. What kind of edible products do Swift & Company make?

A. Edible fatty products, I take it, you mean?

Q. 11. Yes?

A. Lard and lard substitutes, cottonseed oil.

Q. 12. What are the lard substitutes which Swift & Company make?

A. The lard substitutes are composed of refined cottonseed oil and a certain proportion of stearin.

Q. 13. What is the origin of the stearin?

A. Formerly stearin had its origin from beef tallow. That is, it is the harder portion of beef tallow which has been separated from the softer oleo oil. In the early days of lard compound making that was the only stearin used for the purpose. Later however, hardened cottonseed oil, hardened by hydrogenation process, has been substituted to some extent.

Q. 14. To what extent does Swift & Company produce lard substitutes, combining cottonseed oil and a hard fat in the relation you specified?

A. I have not made any close estimates; I could just give you a rough figure. Say, five million pounds a week; five or ten million pounds a week; something like that.

Q. 15. That would be from, say, 250 million to 500 million pounds a year?

A. It would be something like that; that is, speaking offhand without looking up the record.

554 Q. 16. What kinds of lard are made by Swift & Company?

A. We make three general classes of lard, known to the trade as "Prime Steam Lard," "Kettle Rendered Lard" and "Neutral Lard."

Q. 17. Will you please describe briefly the nature of those three products?

A. The "prime steam lard" is rendered in a closed tank with open steam under about 40 pounds pressure. That is, the fatty tissues are placed in such a tank, then the steam is turned on and the fats are separated from the tissues which enclose and hold them, under the action of the steam; the lard rises to the top and is drawn off. After the lard is taken from the tank it is treated with a small quantity of Fuller's earth for the purpose of bleaching and clarifying it, and after this treatment it is chilled on chill rolls, which causes it to assume a smooth semi-solid consistency, and after that it is put in the packages for sale.

Kettle rendered lard is made from a fatty tissue of the hog in an open kettle provided with a steam jacket. This process is similar to the old fashioned process which was formerly used on the farm, except that they used direct fire then in place of steam. The moisture that is associated with the fatty tissue is driven off for the most part, the cracklings, which is the residue of the tissue, goes to the bottom of the kettle, and the lard is then drawn off and chilled over the rolls and put into pails for the market.

Neutral lard is rendered in a jacketed kettle also, but at a very low temperature, from 125 to 130 degrees Fahrenheit; and the desire of the trade for that goods is not to have a smooth lard but a grainy lard, so it is allowed to grain in storage. That is, the solid portions are allowed to crystallize, so it is quite a grainy mixture.

Q. 18. Will you please produce for the inspection of the
555 Court specimens of these three lards to which you have referred?

A. This (indicating) is a specimen of Swift's "Silver Leaf" brand of lard; that is a prime steam lard.

Here is a sample of "Premium Lard"; this is a kettle rendered lard, and I have here a sample of neutral lard, no special brand. That is sold as neutral lard.

Mr. Pennie: The samples are offered in evidence.

The "Silver Leaf" brand is marked Defendant's Exhibit T.

The "Premium Lard" is marked Defendant's Exhibit U.

The Neutral Lard is marked Defendant's Exhibit V.

Q. 19. For how long has Swift & Company manufactured these lards which have just been introduced in evidence?

A. They have manufactured lards of those types ever since they have been in business, which would be 30 years or more.

Q. 20. How long have you been associated with Swift & Company?

A. Seventeen years.

Q. 21. For how long a period has Swift & Company manufactured and put on the market lard compounds, comprising refined cottonseed oil and hard fat?

A. I can only give you an approximate date; since about 1890.

By the Court:

Q. 22. You said since about 1890 they have made lard of cottonseed oil?

A. Lard substitutes.

556 Q. 23. Do you mean it had a certain amount of cottonseed oil?

A. It is made entirely of cottonseed oil and a stearin.

By Mr. Pennie:

Q. 24. What were the relative proportions of refined cottonseed oil and hard fat contained in these lard compounds or lard substitutes to which you have referred?

A. They contain ordinarily from 85 to 90 per cent. of cottonseed oil and the rest is stearin; that is, ten to fifteen per cent.

Q. 25. Will you please produce specimens of these lard compounds?

A. I have here two typical ones. The first is Swift's "Jewel Shortening" and is the type of white lard substitute or compound.

Q. 26. What is that made of?

A. That is made of refined cottonseed oil and oleo stearin.

Q. 27. In what proportions?

A. About 88 per cent. of cottonseed oil and 12 per cent. of oleo stearin.

I have here also a sample of Swift's "Cotosuet," which is a yellow product of the same general nature.

Q. 28. How is the yellow color produced?

A. The yellow, this is an artificially colored product. Butter color is used to produce it.

By the Court:

Q. 29. What is the proportion in that?

A. Approximately the same.

By Mr. Pennie:

Q. 30. The proportions of refined cottonseed oil and oleo stearin in the "Cotosuet" which you have just produced are the same

557 as in the other lard compounds?

A. Yes; the reason for varying the formula is because of

climatic conditions and seasons. In hot summer weather it is desirable to add a little more of stearin to stiffen it up and in winter to reduce the quantity. It is customary for the Southern trade and the Mexican and West Indian trade to use more of the hard material.

Mr. Pennie: The samples produced by the witness are offered in evidence.

Marked Defendant's Exhibits W and X.

Q. 31. Are these products made of cottonseed oil as useful for their purposes as lard?

A. They function the same as lard; they are cheaper than lard; we do not regard them as high grade a product as lard.

By the Court:

Q. 32. What do you mean by as high grade; do they not do as good cooking?

A. I think you would like the products made with lard. I think you would prefer the flavor of that; I would.

Q. 33. And there is a perceptible difference, is there?

A. I believe there is, because lard is distinctive; it has a characteristic odor and flavor.

By Mr. Pennie:

Q. 34. Will you please state what oleo stearin is, for the information of the Court?

A. Oleo stearin is the hard portion of the beef tallow.

Q. 35. How is it obtained?

A. The beef fat is first rendered in open kettles, and then it is allowed to grain after rendering. That is, the stearin is
558 allowed to crystallize, and after these crystals have formed it is compressed, it is put in pressers and the softer portions are squeezed out from the hard portion, the hard portion remaining as the oleo stearin of commerce.

Q. 36. Is this operation carried on at a high temperature?

A. Moderately warm, what you would call a decidedly warm room; about 85 degrees Fahrenheit.

Q. 37. What can you say as to the smoking point of lard as compared with these lard compounds?

A. They smoke at about the same points. It depends upon the treatment to which the fat has been subjected as to just what the smoking point would be. If the product has been subjected to high temperature or steam blowing in the refining process, the smoking point is made higher by that process.

Q. 38. That is true of not only a lard, but of lard compounds as well?

A. Yes; or of any fat whatsoever.

Q. 39. Or of any fat whatsoever?

A. Any oil or fat whatsoever.

Q. 40. What is the effect of passing lard through Fuller's earth, with respect to the smoking point of the lard?

A. The lard so treated has a lower smoking point than it would otherwise have.

Q. 41. Is that likewise true of lard compounds?

A. It would be true of anything treated with Fuller's earth; of any fat treated with Fuller's earth.

Q. 42. You have referred to the action of superheated steam upon the lard after it has been subjected to Fuller's earth; what is the effect of that?

A. The effect of treating oil or fat with superheated steam, or a steam at high temperatures would be to drive off more or less
559 of the volatile substances which cause smoking and thereby raise the smoking point.

Q. 43. That is true of lard compounds also?

A. That is true of lard compounds, also; yes.

Q. 44. Swift & Company, as I understood you, make a lard compound in which instead of using oleo-stearin derived from beef tallow, hydrogenized oil is used; is that true?

A. That is correct.

Q. 45. How hard is the hydrogenized cottonseed oil that is used for those purposes?

A. About 55 degrees titer.

Q. 46. How does that hardness compare with the samples that I now show you of a hardened cottonseed oil, which has been introduced in evidence as Plaintiff's Exhibit 3?

A. As near as I can judge it would be of about this hardness without making a definite test of it.

Q. 47. What do you do in order to make up that compound or blend of refined cottonseed oil and hardened hydrogenated cottonseed oil?

A. The hydrogenized fat is melted and mixed with liquid oil. It is then placed in the deodorizer and blow in the steam at a high temperature for a certain length of time after which the product is caused to pass over the chilling rolls to chill it, and then it is put into packages as usual.

Q. 48. Are lard compounds of that composition; that is to say, of refined cottonseed oil and of hydrogenized cottonseed oil of the degree of hardness which you have mentioned likewise sold in large quantities by Swift & Company?

A. Yes.

Q. 49. To what extent?

A. I have not the figures; the figures would be quite large. I do not think I would say offhand just how much of that is produced now.

560 Q. 50. Can you give us some minimum quantity as their output of manufacture and sale?

A. It might be in the neighborhood say of 1,000,000 pounds a week; something like that; it might only be half a million; I cannot tell.

Q. 51. You have not those figures?

A. Of this particular product made from hydrogenized fat?

Q. 52. Of this particular product made of refined cottonseed oil and hard hydrogenized cottonseed oil?

A. Yes.

Q. 53. Has Swift & Company, a plant for the manufacture of hardened cottonseed oil outside of Chicago, anywhere?

A. The only plant we have is at Fort Worth, Texas, for making those products.

Q. 54. How is the hydrogenized cottonseed oil made in that plant?

A. It is made by causing hydrogen to pass through oil in which a catalyser is mixed.

Q. 55. What is that catalyser?

A. Finely divided nickel.

Q. 56. To what degree of hydrogenation is the refined cottonseed oil brought in those operations?

A. To 55 degrees titer.

Q. 57. Can you show me a drawing illustrating the apparatus at that plant at Fort Worth, Texas?

A. This diagram illustrates the apparatus in which the cottonseed oil is hydrogenated. It consists of a closed vertical tank containing a heating coil for steam and an open hydrogen coil at the bottom. Oil and finally divided nickel are placed in the tank heated up to the proper temperature and the hydrogen is allowed to pass up through the oil and catalyser.

Q. 58. I notice that on this drawing there are certain indications of the purpose of various parts thereof; will you please identify these?

561 A. At the left hand upper corner on the head of the tank is the oil inlet and on the right hand side is represented diagrammatically the hydrogen outlet. At the bottom of the tank is shown the opening where the oil is discharged after it is hydrogenized, the heating coil is shown here as a helical coil of pipe and the hydrogen coil is shown at the bottom of the tank as an open perforated coil.

Q. 59. What is the capacity of one of those tanks?

A. That tank will hydrogenate 20,000 pounds of oil at one operation.

Q. 60. During what period of time?

A. The time varies with the amount of catalyser used, but in ordinary operations it would be about four or five hours.

Mr. Pennie: The drawing is offered in evidence.

Marked Defendant's Exhibit Y.

Q. 61. Have you ever analyzed cottonseed oil to ascertain whether any stearin, as such, is present therein and if so please give us the results?

A. Our laboratory under my direction has investigated that question quite carefully and we find a small proportion of stearin in cottonseed oil; it shows about two per cent.

Cross-examination.

By Mr. Gifford:

X Q. 62. You have spoken of the compounds of cottonseed oil sold by Swift & Company, as having been made sometimes of from 80 to 90 per cent. of cottonseed oil with oleo-stearin; that is, beef tallow, and at other times of from 85 to 90 per cent. of cottonseed oil and hydrogenized cottonseed oil similar to Exhibit 3; is that correct?

562 A. Yes, approximately. I think you did not have the figures quite right. I said 85 to 90.

X Q. 63. I intended to say 85 to 90.

A. That is right.

X Q. 64. And you have stated that you commenced, or Swift & Company commenced to manufacture and sell this compound of the cottonseed oil with oleo-stearin and beef tallow in 1890, about?

A. I think it was about that year; I was not with the company then; I am just judging by what I have heard people say who were with the company at that time.

X Q. 65. When did Swift & Company commence to manufacture and sell a compound in which there was from 85 to 90 per cent. of cottonseed oil and 10 to 15 per cent. of the hydrogenized cottonseed oil like Exhibit 3?

A. That was in 1915; about two years ago.

X Q. 66. What part of 1915?

A. I do not remember what month that was when we started that operation.

X Q. 67. Prior to 1915, Swift & Company, had never manufactured or sold anything containing hydrogenized cottonseed oil, had they?

A. According to my recollection the year is correct; I would want to check that up; I would like to look up the records; it was around 1914 or 1915.

X Q. 68. Then you answer my question "yes," as I understand it?

A. Yes, they did not manufacture prior to that time; approximately that time. As I said, I would want to check that date up.

X Q. 69. Since that time have they continued to manufacture and sell the compounds containing the oleo-stearin or beef tallow?

A. Yes.

X Q. 70. How have the two compounds compared in quantities of output?

563 A. We make much more compound with oleo-stearin than we do of the hydrogenized product.

By the Court:

Q. 71. There is no compound of the hydrogenized product; it is all cottonseed oil?

A. I have no exhibit of the other kind; you mean the product corresponding to this (indicating)?

Q. 72. Yes.

A. No; we do not make such a product; we simply use the hard hydrogenized product similar to this as a substitute for the oleostearin. That is mixed with the oil, of course, from ten to fifteen per cent.

By Mr. Gifford:

X Q. 73. You did not make any lard substitute like "Crisco" consisting entirely of hydrogenized product?

A. No; we do not make such a product.

X Q. 74. When did you enter the employ of Swift & Company?

A. About 1899.

X Q. 75. And did you know before Swift & Company commenced to make or sell any hydrogenized oil that the hydrogenized cottonseed oil food industry had been introduced and established by Procter & Gamble?

A. I had understood that Procter & Gamble were making those products, yes.

X Q. 76. Do you know whether Swift & Company are sued by Proctor & Gamble under this patent No. 1,135,935, dated April 13th, 1915, to John J. Burchenal, assignor of the Proctor & Gamble Company?

A. Yes, they are.

X Q. 77. Sued for infringement?

A. Yes.

X Q. 78. And the thing claimed to infringe in that suit is what you have referred to as the compound consisting of from 85 to 90 per cent. of cottonseed oil and 10 to 15 per cent. of the hydro-
564 genized cottonseed oil, such as Plaintiff's Exhibit 3?

A. Yes, that is correct.

X Q. 79. I now refer to the drawing, Defendant's Exhibit Y. I understand from your description that the hydrogen enters this closed vessel from this perforated coil at the bottom, marked "hydrogen coil"; is that correct?

A. Yes.

X Q. 80. And escapes at the opening marked "hydrogen outlet" at the top?

A. Yes.

X Q. 81. What pressure is that hydrogen under?

A. In the tank or as it enters?

X Q. 82. As it enters?

A. It comes from a tank which we keep at about 125 pounds pressure.

X Q. 83. And what is the pressure in the hydrogenizing vessels shown in this drawing?

A. It varies from zero to about 40 or 50 pounds.

X Q. 84. You mean that you begin the operation at the lower pressure and increase it while the operation is in progress?

A. Yes; it works more or less automatically that way, because at first the absorption of the hydrogen is pretty rapid, so we pass quite a good deal of hydrogen at the bottom, but it is all taken up before it gets to the top of the tank.

X Q. 85. How long did you say the operation took?

A. About four or five hours.

X Q. 86. And you begin the operation with no pressure and run it up during the operation so that at the end of the four hours it is forty pounds; is that it?

A. Yes.

X Q. 87. The pressure gradually ascends during the whole of that time?

A. Yes; the major part of that operation, of course, is completed in the beginning—that is, the hydrogen absorption is much more rapid at the beginning than at the end.

X Q. 88. You have not shown any catalyser in this drawing?

A. It would be very difficult to do that.

565 X Q. 89. How is the catalyser supported?

A. It is suspended in the oil.

X Q. 90. What caused it to suspend itself in the oil and not settle to the bottom?

A. The bubbling of the hydrogen up through it keeps it up.

X Q. 91. And is the nickel of the catalyst deposited on anything?

A. No.

X Q. 92. It is simply the finely divided metallic nickel?

A. Yes.

X Q. 93. There is nothing corresponding with infusorial earth or anything of that kind, the nickel being made to drop to the bottom?

A. It all depends upon the fineness of the particles. If it is in chunks it would; but it is pretty finely divided.

X Q. 94. How finely divided?

A. Oh, microscopic size.

X Q. 95. So it is this microscopic size of the nickel that enables it to remain in suspension, coupled with the bubbling up of the hydrogen, as I understand it?

A. That is right.

X Q. 96. And that is all that keeps it in suspension?

A. That is correct.

X Q. 97. How do you make your nickel so as to get it in that form of microscopic metallic particles?

A. Make it by reduction of nickel——

X Q. 98. You make it yourselves?

A. Yes, we make it ourselves.

X Q. 99. Is it reduced to this microscopic size of particles as the final operation or before it is completed?

A. Do you mean do we grind it?

X Q. 100. When do you grind it?

A. We do not grind it; it just comes out that way. You take a

nickel nitrate and heat it, the oxide form is finely divided; it is naturally that way; you do not have to grind it.

X Q. 101. Then there is no additional operation except
566 to take it as it is formed?

A. Just the way it naturally comes out chemically; it is finely divided.

X Q. 102. I notice on these cans that you have put in—which of these specimens which you have produced of Swift & Company's manufacture is the compound of cottonseed oil and hydrogenized cottonseed oil?

A. I have not produced such an exhibit. Those are made with oleo-stearin; I merely described the other.

X Q. 103. Those that were compounds of cottonseed oil and oleo-stearin are marked "U. S. inspected and passed by Department of Agriculture. E. S. T. 71." Is the compound made of cottonseed oil and hydrogenized cottonseed oil so marked?

A. No; not unless it contains animal product in it.

X Q. 104. In other words, the all-vegetable lard substitute is not inspected by the United States authorities?

A. Not at the factory; no.

X Q. 105. Is it inspected anywhere?

A. Yes; under the Foods and Drugs Act.

X Q. 106. But that is a different inspection?

A. Yes.

X Q. 107. Why is the animal product or that containing oleo-stearin inspected at the factory by the United States and the all-vegetable lard substitute not so inspected?

A. There is a law to that effect.

X Q. 108. What do they inspect it for?

A. Why do they inspect?

X Q. 109. What do they look for?

A. I could not tell you that; you will have to call on the inspectors; I am not in that line.

X Q 110. Do you know why they make this inspection of the animal compounds and not of the all-vegetable compounds?

A. That is not quite correct. The vegetable compound is inspected but not at the factory; it comes under a different law.

567 X Q. 111. Why do they inspect the animal compound at the factory under that law and not the vegetable compound at the factory?

A. I am sure I do not know; there are two laws.

X Q. 112. You have stated that the oils used for the finer soaps are no different from the oils used for edible purposes?

A. No essential difference.

X Q. 113. What oils are used for finer soaps?

A. Cottonseed oil is one of them; cocoanut oil is another.

X Q. 114. Are those the only two?

A. No; I said those were two of them; cottonseed oil, cocoanut oil, peanut oil, lard, beef tallow; any oil that is suitable for the purpose.

X Q. 115. And what oils are used for the less finer soaps?

A. Well, they would be such things as cottonseed foots from the refining of cottonseed oil and the lower grades of tallows, distilled products, distilled fatty acids.

X Q. 116. You have said that there were three kinds of animal lard manufacture- and sold by Swift & Company and that the kind which you have described as neutral lard is grained; is that it?

A. Yes.

X Q. 117. How much of this is sold in comparison with the other lards?

A. I do not think I can give you the figures on that as I have not them in mind at all; I could get them for you.

X Q 118. Are they very small?

A. No; it is a large business; they have a large factory devoted to that and nothing else.

X Q. 119. In comparison with the other two kinds of lards they would be less; they would be much less, would they not?

A. I would not say much less, it is quite a big business.

568 X Q. 120. Where is this neutral lard sold to go?

A. Where is it sold?

X Q. 121. To go; for what trade is it?

A. It goes to the oleo-margarine trade for one part; some of it is used for household purposes, cooking purposes.

X Q. 122. But comparatively little, I suppose?

A. Yes, it is too expensive.

X Q. 123. Most of it is used for manufacturing oleo-margarine?

A. It is the most expensive lard and naturally if the householder can buy it cheaper he does it.

Redirect examination.

By Mr. Pennie:

R. D. K. 124. What is the market consideration that determines whether the lard compounds made by Swift & Company using as the base from 85 to 90 per cent. of refined cottonseed oil employ oleo-stearin or this hardened fat of 55 degrees, centigrade.

A. It is purely a question of market conditions. Sometimes oleo-stearin is the cheaper material to use, and sometimes hydrogenated fat is the cheaper material to use; we are governed accordingly.

R. D. Q. 125. If the oleo-stearin is the cheaper you use that?

A. Yes.

R. D. Q. 126. And if the hardened cottonseed oil is cheaper, you use that?

A. Yes; if somebody else wants to pay more for the oleo-stearin which we manufacture we sell it to them.

R. D. Q. 127. Do you supply the same trade with those two different compounds, one made with the hardening agent, oleo-stearin, and the other with the hardening agent, hardened cottonseed oil?

A. Yes.

R. D. Q. 128. And they are sold indifferently to the trade as such?
A. Yes.
569 R. D. Q. 129. And received by the trade indifferently?
A. Yes.

Recross-examination.

By Mr. Gifford:

R. X. Q. 130. Are they sold under the same brand?
A. Yes; the same brand exactly.
R. X. Q. 131. And under different brands also?
A. Yes; different brands also. I mean to say we have several brands and sometimes one hardening agent is used and sometimes the other. There is a little different label on it, of course. I call attention to that. One says "Government inspected" and the other does not.
Recess.

Afternoon Session.

Mr. Pennie: If your Honor please, when the witness Richardson was on the stand I omitted to ask him to give us an analysis of lard and lard compounds. I would like to recall him for that purpose.

WILLIAM D. RICHARDSON, recalled by the defendant.

Direct examination.

By Mr. Pennie:

Q. 132. Will you please give the analysis of the constituent glycerids of lard and state what lard is composed of and what the analysis is?
A. Lard is composed of the glycerids olein, linolin, stearin and palmitin, but ordinarily we group the last two named, that is stearin and palmitin under the one head stearin, that is the common
570 usage in respect to those saturated glycerids, and making use of those three divisions lard will analyze from forty to forty-two per cent. stearin, forty-eight to fifty per cent. olein, eight to ten per cent. linolin.
Q. 133. One of the exhibits which you produced here was a compound consisting of refined cottonseed oil and oleo-stearin obtained from beef fat. Will you please state the analysis of that compound in terms of its constituent glycerids, stating what those glycerids are?
A. This Jewel compound analyzes as follows (I am not speaking of this particular sample, but of our ordinary Jewel shortening): 29.5 stearin, 29 olein and 41.5 linolin.
Q. 134. And this specimen is the type of the compound that is marketed as "Jewel" being substantially that composition?
A. Yes; this particular sample would have substantially that composition if it was analyzed.

Q. 135. And this applies to the composition as made for how many years?
A. Since approximately 1890.

Mr. Gifford: No cross examination.
Mr. May: I would like to put on Mr. Richter to testify as to the analysis of this particular sample of Crisco that has been offered in evidence and also to testify as to certain experiments that were made prior to the trial.

571 GEORGE A. RICHTER, called as a witness on behalf of the defendant, being duly sworn, testifies as follows:

Direct examination.

By Mr. May:

Q. 1. Your name is George A. Richter?
A. Yes, sir.
Q. 2. And how old are you?
A. Twenty-six.
Q. 3. And you live where?
A. Berlin, New Hampshire.
Q. 4. And what is your employment?
A. Research Chemist and Chemical Engineer for The Berlin Mills Company.
Q. 5. And what are your duties Mr. Richter?
A. My duties are to supervise the laboratory and take charge of all chemical analyses pertaining to the plants.
Q. 6. What chemical education have you had?
A. I am a graduate of the Massachusetts Institute of Technology, 1913; the year following my graduation I worked as a research associate with the Industrial Laboratory of Applied Science at the Institute, after which I became connected with The Berlin Mills Company in Berlin, New Hampshire where I have been since.
Q. 7. And what are your duties at the Research Laboratory of The Berlin Mills Company?
A. To supervise the research work and direct and report all analyses pertaining to all the chemical processes we have.
Q. 8. And you are therefore accustomed to analyze such materials as oils and fats?
A. I am, particularly for the purposes of ascertaining iodin value there.
Q. 9. Separating the liquid fatty acids and ascertaining their iodin value?
A. Yes.
572 Q. 10. And determining the percentage of the compound glycerids in such fats and oils?
A. I am.
Q. 11. In the early part of this present month of March, I have sent you a sample of fat which had been furnished me by Mr. Pennie and which had been removed from a can of "Kream Krisp" which has been offered in evidence as a part of the stipulation, Plaintiff's

Exhibit No. 2, that is, I sent it to the Research Laboratory of The Berlin Mills Company. Was that received?

A. I received that sample.

Mr. May: As a matter of fact if your Honor please, we were asked to stipulate that this was material manufactured by The Berlin Mills Company; and in the presence of counsel, I understand that a part of it was removed and the can then sealed. The first sample of it was sent to The Berlin Mills Company, but was not of sufficient size to make all of the identifying tests and a second sample was sent a little later. The first sample was sent to me and I sent it by registered mail to the Research Laboratory.

Q. 12. What did you do with this sample that was sent to you?

A. This first sample that was sent to us we analyzed for iodin number, the iodin number of the liquid fatty acids, melting point and the Halphen test. If I remember rightly the sample was exhausted after having given these tests. We sent for another sample which was forwarded and on this second sample we determined the titer and the saponification number of it.

Q. 13. Please state what results you obtained from these analyses and tests?

A. The melting point is 35.7 degrees Centigrade; the iodin
573 number is 94.7; the iodin number of the liquid fatty acids 137.5; the titer 33.85.

Q. 14. That is degrees Centigrade?

A. That is degrees Centigrade. Using the liquid fatty acid iodin number and the iodin number of the oil we calculated the composition to be as follows: Saturated fats 28 per cent.; olein 34.3 per cent.; linolin 37.7 per cent. The saponification number of the fat was 194.5, the Halphen test was negative.

The Court: That is a test from what?

Mr. May: Of the defendant's product which had been taken from the sample can, offered in evidence by plaintiff.

Q. 15. Are you familiar with the defendant's product generally which is manufactured by the hydrogenization of cottonseed oil and placed upon the market under the name of "Kream Krisp"?

A. I am.

Q. 16. And you have had occasion many times to analyze that product?

A. Several times.

Q. 17. Have you analyzed the cottonseed oil that was employed in the manufacture of "Kream Krisp"?

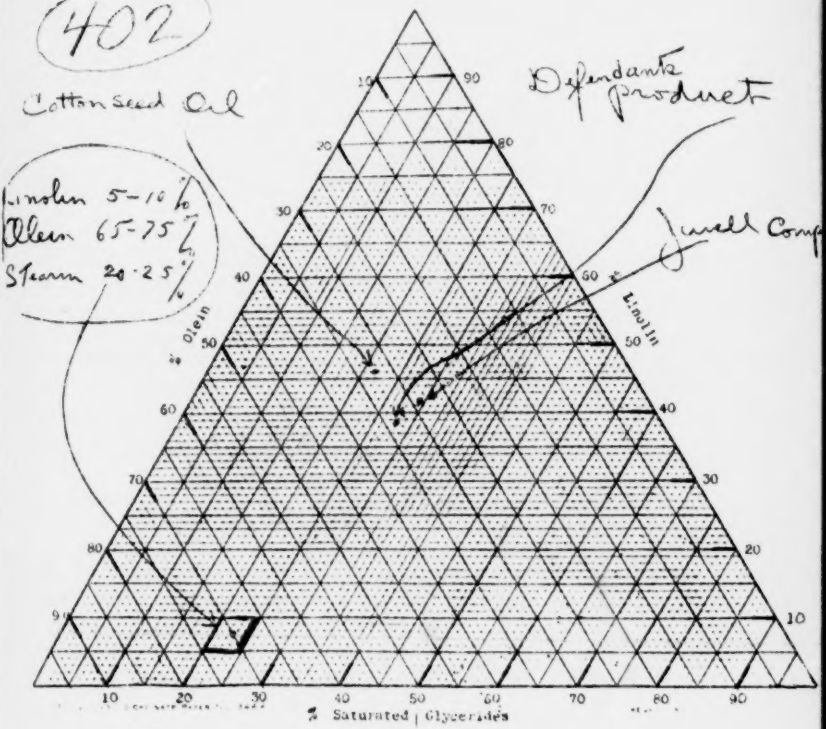
A. Yes, sir.

Q. 18. What did you find the proportions of the compound glycerids of that cottonseed oil to average?

A. The average value of our average cottonseed oil is in composition: saturated fats 21.5 per cent.; olein 32.5 per cent. and linolin 46 per cent.

Q. 19. Now, are you familiar with the triangular chart such as described by Dr. Walker in charting three components?

402



433

Berlin Mills Co
v.
Procter & Gamble Co.
} 5754

575 that covers a larger area than the other point?

A. Well the four sided figure indicates a range. The point indicates but one composition.

Q. 27. Now will you please indicate by writing upon this chart the proportions of the component glycerids indicated by this four sided figure and connect it with a line to that figure?

A. (Witness does so.)

Q. 28. Now I will ask you to locate one more fat upon that chart to-wit: One having 29.5 per cent. stearin, 29 per cent. olein, and 41.5 per cent. linolin.

A. (Witness does so.)

Mr. May: I understood if your Honor please, that that was the proportion of the component glycerids given by Dr. Richardson as indicated in Jewel compounds.

Q. 29. I will ask you to indicate this last compound that you have made by a line and write "Jewel Compound."

A. (Witness does so.)

Q. 30. You have stated that in the sample of defendant's product which was sent you for analysis from the can which was attached to the stipulation, Plaintiff's Exhibit No. 2, on testing the material with the Halphen reagent, that you obtained a negative result. How did this manifest itself?

A. The Halphen test consists of treating the oil in question with a reagent. This reagent is made by means of equal proportions of amyl alcohol and carbon disulphide with a trace of sulphur. Equal proportions of this reagent and the oil are taken and heated. If there is cottonseed oil present as such a positive test is indicated by a deep red coloration. In the sample which we received from you this deep red coloration did not take place.

576 Q. 31. Had you previous to the time tested defendant's products formed by the addition of hydrogen to cottonseed oil with the Halphen reagent?

A. Yes, several times.

Q. 32. What results did you previously secure?

A. We always secured positive results in this reaction, never before have we secured a negative result. In other words, this product which you forwarded was the first product that I have ever tested, or to my knowledge that has ever been tested in the laboratory which has shown a negative Halphen test.

Q. 33. You are referring now to the "Kream Krisp" manufactured in the same way that this material was manufactured from cottonseed oil?

A. Yes, sir.

Q. 34. How do you account for the fact that that sample which was sent you gave a negative result?

A. We looked into the matter pretty carefully and I explain it in this way: The oil previous to being hydrogenated, is preheated in a tank such as indicated in the talk of yesterday in order to bring the oil to a temperature high enough to assure immediate hydrogenation when entering the hydrogenator. It is probable that in some cases the oil may have been retained in this preheater tank long

enough at an elevated temperature to have destroyed the Halphen test. I can conceive of such a thing taking place in case of an accident to our plant, causing a temporary shut down.

Q. 35. And the heating of the cottonseed oil at an elevated temperature does destroy those chromogenatic substances which causes the red coloration when the oil is treated with the Halphen reagent?

A. Yes, sir, heating the oil will destroy this test.

Q. 36. That heating destroys the capacity of the oil to respond to the Halphen test?

A. Yes, sir.

577 Q. 37. That is what you mean?

A. Yes.

Q. 38. But the material is cottonseed oil just the same?

A. The oil is not different in any chemical way that we know of, merely that the qualitative Halphen test has been disposed of.

Q. 39. Now, at the Research Laboratory of The Berlin Mills Company have you hydrogenized any oils other than by the process which was described by Dr. Walker yesterday?

A. Yes, we have. We have hydrogenated oils in the laboratory by three or four or possibly five different sets of apparatus. Do you wish me to describe them?

Q. 40. Yes.

A. I would be glad to.

Q. 41. Yes, if you will, I shall be glad to have you describe them.

A. Our simplest type of apparatus is probably an ordinary flash which is submerged in an oil bath. In carrying out this hydrogenating we place the oil to be hydrogenated within the flash and place reduced nickel or any other catalyser, within, and closing the flash we bubble hydrogen through a two hole stopper. In other words, the hydrogen is bubbled through the oil, thus keeping the catalyser in suspension and hydrogenating the product somewhat similar to that too (indicating apparatus).

Q. 42. Except for the shape of the tube?

A. The principle is the same.

Q. 43. The principle is the same; and you have there the flash and the tube produced yesterday as Defendant's Exhibit K.

A. We used a larger flask.

Q. 44. But you have a stopper with one tube running down so that the lower end will be submerged below the level of the oil and the other tube leading out near the top of the flash?

A. Yes, sir. The second type of apparatus consists of a

578 horizontal cylinder usually of cast iron through which we have put a shaft. On the shaft we have agitators of different types. The shaft runs through two stuffing boxes at the end of the cylinder and is driven by a pulley and motor. The oil is placed within this horizontal cylinder with the catalyser and hydrogen then admitted to one end and gradually fed to the apparatus as the hydrogen is being taken up by the oil.

Q. 45. I will ask you to look at Fig. 1 of the drawing of the Kayser patent No. 1,004,035 which was introduced in evidence as a part of Defendant's Exhibit F, and will you state how that ap-

paratus you have last described corresponded with the device shown on that figure?

A. It is approximately the same, in principle at least. We have some small alterations that are insignificant as far as the principle itself is concerned.

Q. 46. Have you any photographs?

A. We have.

Q. 47. Of that apparatus?

A. Yes, sir.

Q. 48. Would you produce them?

A. I will have to refer to my notes. I have here a photograph of the apparatus as set up ready to operate.

Q. 49. What is the number of that photograph?

A. The number of this photograph is A-186.

Q. 50. Will you please just briefly describe that apparatus so that his Honor will understand it?

A. It consists of the horizontal cylinder through which the shaft extends, the agitator *than* being driven by a belt and motor; the hydrogen is led into the apparatus from the hydrogen cylinder as shown in the front and the pressure read by means of a pressure gauge. The apparatus which is heated electrically by winding this cast iron cylinder by nicrome wire through which an electric current is passed which generates the heat, and heats the apparatus to any desired temperature. The actual temperature of the oil then is also regulated by means of a thermometer cup which extends down from the top of the apparatus into the oil and the temperature is controlled by means of a switch and induction coil shown in the photograph.

579

Q. 51. Was the cast iron vessel covered?

A. The cast iron vessel is lagged to prevent too much loss in heat radiation.

Q. 52. Have you a photograph of the agitator that was inside?

A. Yes, sir. One type of agitator tried in this apparatus is shown in Photograph A-187.

Q. 53. Just give a brief description of that?

A. This agitator consists of one horizontal shaft upon which are mounted screens consisting of a coarse wire, arranged at angles of about 60 degrees to each other. This agitator serves the purpose of lifting the oil and agitating the entire mass of oil in the catalyser in order to keep the catalyser in suspension. This is the ordinary type of agitator used in many chemical processes.

We also have another type of agitator which was used in this same machine which consists in having two shafts extending into the apparatus from opposite sides. These shafts rotating in opposite directions, and each shaft provided with a set of iron bars. In other words, it serves the purpose of a disintegrating device and tearing up the oil and the catalyser and to effect, probably, a more efficient agitation. That is shown in Photograph No. A-189.

Photograph A-188 we have still another view in this of this same agitator.

And in Photograph A-159 still another view of this same type of agitator.

580 Mr. May: I offer these photographs in evidence.

Five photographs produced by witness marked Exhibit Z.

Q. 54. Last November you hydrogenized cottonseed oil in that apparatus in the presence of counsel and experts for the plaintiff?

A. Yes, sir.

Q. 55. Will you please describe just what you did with the oil—describe the process?

Mr. Gifford: What is that process supposed to be?

Mr. May: The process of hydrogenizing that he has just described.

A. In the process that we carried out at the Berlin's Mills in the presence of defendant's and plaintiff's counsel, we carried it out as follows: The catalyser was prepared in the following way: Seven pounds of nickel sulphate, crystallized, was dissolved in a small amount of warm water; and in this slurry condition 2.8 pounds of kieselguhr was added. This kieselguhr and the nickel sulphate was then mixed thoroughly by kneading with the hands. After this had been thoroughly mixed, three pounds of soda ash was worked into the dough and then more water added, and the whole mass warmed up. Finally the mass was filtered first and the kieselguhr, that is the nickel attached to the kieselguhr, was washed thoroughly.

Mr. Gifford: Was all this done when we were there?

Q. 56. The catalyser was prepared prior to the coming or advent of these gentlemen upon the scene?

A. Yes, sir.

581 Q. 57. It had taken some time to prepare that?

A. Yes; took probably three days to do the entire thing, to prepare the catalyser, but this is the way it was prepared.

The product obtained was then washed and calcined and ground in a ball mill. This calcined mass was then reduced by means of hydrogen, by passing the hydrogen over the catalyser in a four-inch iron pipe which was heated electrically. This was done at a temperature of 500 degrees centigrade and took about 15 hours. The resulting mass was then cooled in hydrogen at a temperature of 200 degrees centigrade and the CO_2 was led over the apparatus until it cooled to ordinary temperature.

Q. 58. Pardon me; what do you mean by CO_2?

A. Carbon dioxide; I beg your pardon.

Q. 59. Go on, plese.

A. The reduced product was then stirred into a quantity of oil amounting to five pounds of oil.

Q. 60. Why was that done?

A. This was done to protect the catalyser against oxydation and to insure the activity of the catalyser. This catalyser was used in the hydrogenation process as carried out in the laboratory at that time.

Q. 61. What was the material which you produced by the treat-

here which says sample L–6 was removed from the apparatus at 3:18 p. m.; L–7 was removed from the apparatus at 4:03 p. m. I believe the counsel for the Procter & Gamble Company were there at that time. The samples from the run which were called K in the same apparatus were run for a longer period.

Q. 80. At what time was that operation started, Mr. Richter?

A. The run which we called L?

Q. 81. Yes.

A. Started at 10:30 A. M.

Q. 82. And the temperature was what?

A. The temperature at that time was 159 degrees centigrade.

Q. 83. When did you take the first sample?

A. The first sample was taken at 11:30 A. M.

Q. 84. And when was the second sample taken?

A. The second sample was taken at 12:30 P. M.

Q. 85. And these samples were kept as L–1 and L–2?

A. As L–1 and L–2.

Q. 86. What was the melting point of L–2?

A. The melting point of L–2 was 97-5 degrees Fahrenheit, which in centigrade is 36.4.

Q. 87. And the third sample was taken at what time?

A. The third sample was taken at 1:30 P. M.

Q. 88. And the melting point was what?

A. The melting point expressed in centigrade is 39.4.

Q. 89. Now, the next sample was taken when?

A. L–4 was taken at 2:00 P. M.

Q. 90. What was the melting point?

A. The melting point of that sample was 41.2 centigrade.

Q. 91. Now, the next sample?

A. The next sample we called L–5 was taken at 2:52 P. M. with a melting point of 41.8 centigrade.

586 Q. 92. And the next sample was taken when?

. The next sample which we called L–6 at 3:18 P. M.

Q. 93. And had a melting point of what?

A. And had a melting point of 42.1 degrees centigrade.

Q. 94. Now, the final sample was taken when?

A. The final sample which we called L–7 was taken 4:03 P. M. and had a melting point of 42.8 centigrade.

Q. 95. Now, how did the temperature of the oils during these processes range?

A. They ranged substantially very close to 160 degrees centigrade: Varying from 159 to 163 degrees centigrade.

Q. 96. Did you not have a lower temperature than that, just look clear through your notes and give the lowest temperature that you find?

A. I find one here at 157 degrees centigrade.

Q. 97. Have you one of the samples of the material that you have called L–6 and L–7 which were produced by the hydrogenizing of cotton-seed oil with that apparatus which you have described using the nickel catalyst?

A. Yes, sir.

Q. 98. Used by precipitating nickel on kieselguhr?

A. Yes, sir. Sample which we called L–6, this is one sample of it (producing). And this is a sample of the batch called L–7, the last sample taken from the apparatus.

Q. 99. Are these two samples in precisely the same condition in which they came out of the converter with the nickel therein or were both filtered?

A. These samples were both filtered to remove the nickel.

Q. 100. Otherwise each is the same?

A. Otherwise they are untreated.

Mr. May: I will offer these two samples in evidence.

Marked A–1 and B–1.

587 Mr. May: A–1 is L–6 and B–1 is L–7.

I offer some in bottles. In order that your Honor might perceive the character I thought it would be better to have some in pans so you could see it. The melting point of the same is about 41 or 42 degrees centigrade, and as a matter of fact the melting point in Fahrenheit is 107.8 of the L–6 and of the L–7 108.9 Fahrenheit.

If your Honor please, I will substitute these bottles for the pans.

Q. 101. This operation happened just before Thanksgiving last year?

A. Yes, sir.

Q. 102. It was the day before, wasn't it?

A. Yes, the day before.

Q. 103. Have you any more of that same material which you have aerated?

A. Yes, sir, we have some samples of L–6 and one of L–7 which I have aerated by rubbing in a mortar.

Mr. May: Your honor, these have been sitting close to the steam pipe here and they may be soft.

Q. 104. Will you produce them and will you state what you did with these samples?

A. These samples were rubbed in an ordinary chemical mortar, that is a laboratory mortar with a pestle for 15 or 20 minutes in order to reduce the granulation and introduce air into the mass.

Q. 105. In other words, you endeavored to approximate so far as possible the action that takes place in carrying the material over chilling rolls and aerating it with pickers?

A. Yes, on a laboratory scale.

588 Q. 106. And these are operations performed on the identical materials which were, you said, L—6 and L—7?

A. Identical.

Mr. May: I offer them in evidence, they are the aerated samples.

Marked C–1 and D–1.

Mr. May: L–6 is C–1 and L–7 is D–1.

Q. 107. Have you analyzed these samples which have been referred to by you?

A. Yes, sir.

Q. 108. As L–6 and –7?

A. We have.

Q. 109. Please state the result of that analysis?

A. In L–6 the titer is 40.7 degrees centigrade. The iodin number is 55.4; the iodin number of the liquid fatty acid 96.1; the compound glycerids are saturated glycerids which equals 39.9 per cent., olein 56.2 per cent.; linolin 3.9 per cent.

Q. 110. That was L–6?

A. That was L–6. Sample L–7 analyzed as follows. Melting point 43.1 degrees centigrade; titer, 45.1 degrees centigrade; iodin number 54.5; iodin number of the liquid fatty acid 95.7; saturated glycerids 40.5; olein 55.6; and linolin 3.9 per cent.

Q. 111. What did you say was the melting point, Mr. Richter?

A. Of L–7?

Q. 112. L–7?

A. 43.1 degrees centigrade.

Mr. Gifford: That is not what you gave before.

Mr. May: At this point in order that I may use another chart I will offer in evidence the chart which the witness had previously used and I will call the chart No. 402 and that also will be reduced.

589 Q. 113. On this triangular chart which I will refer to as 403 I will ask you to please locate the two materials L-6 and L-7?

A. I have done so.

Q. 114. What does the constant rise in the temperature of the melting point of those materials which you took from time to time from the apparatus indicate?

A. A corresponding increase in the saturated glycerids during hydrogenation.

Q. 115. What was happening to the cotton-seed oil glycerids during this operation?

A. Part of them were being hydrogenized to a saturated state.

Q. 116. And what had occurred to the linolin which had been present in large quantities?

A. The linolin was reduced very materially.

Q. 117. Reduced to what point?

A. Down to a point of 3.9 per cent.

Adjourned until Monday, March 26th, 1917, at ten thirty, A. M.

NEW YORK, March 26th, 1917, 10:30 A. M.

Trial Resumed.

GEORGE A. RICHTER resumes the stand:
Direct examination.

By Mr. May (continued):

Q. 118. On Friday when the adjournment was taken you were describing a process of hydrogenation which was practised in November, 1916, at the defendant's research laboratory in the presence of plaintiff's counsel and experts, and had referred to the particular operation or run, as you call it, by the letter L and had referred to the samples of fat taken from time to time from the hydro-
590 genator as L^1 L^2, and so forth. This operation you stated was started at 10:30 A. M. and completed at 4:30 P. M. when you finally withdrew the charge from the hydrogenator and of that charge L^7 is a sample. Now, please state on what day of the month that particular operation took place?

A. That particular operation took place November 28th; the second day of this experiment.

Q. 119. So that when you previously said it was on the 27th you were in error?

A. I was wrong.

Q. 120. When were (not this particular run) but when was the whole series of experiments started?

A. About 2:00 o'clock on the 27th of November.

Q. 121. You said that at these experiments Mr. Morrison, Mr. Allen and Mr. Townsend were present at the laboratory. That is the same Mr. Morrison who has already testified in this case?

A. Yes.

Q. 122. Who else was there on the part of the plaintiff at the laboratory?

A. A gentleman named Mr. Eaton was there for those two days.

Q. 123. Referring to that L run as you have described it, why did you take samples of fat from time to time from the hydrogenator?

A. To see how the hydrogenation was proceeding, progressing, and to examine the product from time to time to see how the melting point was increasing.

Q. 124. You were endeavoring to obtain products having a melting point of substantially what?

A. 42 and 43 degrees Centigrade.

Mr. Gifford: If your Honor please, to prevent any dispute, counsel from the other side and our side have agreed to this statement with respect to the catalyst in that portion of the operation itself. I will read it.

591 Subject to correction if error be discovered it is agreed that the catalyst from which L^6 and L^7 were made was in accord-

ance with the formula appearing on the notes referred to in question 849 of Burchenal's deposition which formula was omitted from the record as indicated in that question.

It is also agreed that plaintiff's Counsel and experts left of their own volition Tuesday, November 28th, 1916, during the hydrogenizing of L^6 and L^7 with the understanding that it would be continued until products having melting points of about 42 and about 43 were reached and then the hydrogenizing would be stopped.

Plaintiff admits that samples of L^6 and L^7 were received by its expert within a short time after November 28th, 1916.

Q. 125. Have you with you and are you able to produce the samples taken during that L run numbered L^1 to L^5 inclusive?

A. Yes; I have them. Those are the samples.

Q. 126. Did plaintiff's experts also get similar samples when they were at the laboratory?

A. Yes; they obtained all but the last two, I believe, and those last two were forwarded to them subsequently.

Mr. May: I offer these samples in evidence. Marked Defendant's Exhibits E-1, F-1, G-1, H-1 and I-1.

Q. 127. Why do these samples appear to be black or dark colored?

A. They still have the catalyser mixed with it.

592 Q. 128. And this is the way this material appears as it was drawn from the hydrogenizing apparatus?

A. Yes.

Q. 129. Is it edible in this condition?

A. Not in that condition; it may be made edible by filtration.

Q. 130. But in the condition in which these sameples ar now they are not edible.

A. I should say not.

Q. 131. They contain nickel?

A. Which is poisonous.

Q. 132. Did the samples L^6 and L^7 which are Defendant's Exhibits A-1 and B-1 appear dark colored before they were filtered?

A. Yes.

Q. 133. And have these samples L-6 and L-7 been treated with Fuller's earth and then de-odorized?

A. No; they have not.

Q. 134. Are these samples L-6 and L-7 edible?

A. They are.

Q. 135. When that L run was made with which agitator was the hydrogenating apparatus provided? In answering that question I will ask you to look at the Defendant's Exhibit Z and refer by number to the photograph which illustrates the agitator?

A. The agitator used in the run called L is illustrated in Photograph A-187, the single shaft running through the entire apparatus.

Q. 136. So that hydrogenator then was provided with a single shaft driven by a single belt and pulley instead of having two?

A. Instead of two belts and pulleys which infers that the agitator was of this type, or squirrel type, meaning that the two agitators are

used as a disintegrator for rotating in opposite directions, in our experiment there was one agitator running throughout the entire vessel, one direction only, as is illustrated in A-187.

593 Q. 137. Had you previously made another run with that hydrogenator on the 27th of November?

A. Yes; we started a run in the afternoon of the 27th, ran all night and completed this run in about fifteen hours.

Q. 138. And that run was called what?

A. That run was called K, K-1, K-2, and so forth.

Q. 139. And this run was also accomplished in the presence of plaintiff's counsel and experts?

A. Yes.

Q. 140. Please describe what was done in making that run?

A. In this run called K we used a per cent. of the catalyser figured as nickel to the per cent. of oil, of one per cent.; 30 pounds of oil were used and a temperature of 160 degrees centigrade maintained as closely as possible. The agitator was run at 108 revolutions per minute, and the hydrogen passed in under atmospheric pressure. A large sample was taken when the product reached a melting point of 39 degrees centigrade, and the rest of the batch was run up to a melting point of 52.3 centigrade. These samples were labeled K-1, K-2, and so forth. The total run took about twelve hours and the temperature range during this run varied from 156 to 164 degrees centigrade.

Q. 141. When you referred to the nickel catalyser by weight, you mean by weight in reference to the weight of the oil?

A. In reference to the weight of the oil; yes.

Q. 142. That is to say——

A. We used the one per cent. nickel based on the weight of the oil.

Q. 143. And you took samples from time to time of the material being hydrogenized during that K run?

A. Yes.

Q. 144. And these were lettered K-1, etc.?

A. Yes.

594 Q. 145. Will you please give the melting point of these various samples in the order in which they were taken from the hydrogenating apparatus?

A. The melting point started with the K-3 sample and are as follows:

K-3—32.55 degrees centigrade.
K-4—33.6 degrees centigrade.
K-5—35.2 degrees centigrade.
K-6—38.4 degrees centigrade.
K-7—38 degrees centigrade.
K-8—41.1 degrees centigrade.
K-9—46.5 degrees centigrade.
K-10—49.4 degrees centigrade.
K-11—52.3 degrees centigrade.

Q. 146. You said that the melting point started with the K-3 sample?

A. Yes.

Q. 147. Why was that?

A. The two previous samples were too soft to obtain a melting point on it.

Q. 148. In other words they were liquid?

A. Liquid.

Q. 149. Approximately what intervals occurred between the taking of these samples?

A. The first sample was taken 17 minutes after the run had started; the second sample was taken 27 minutes after the run had started; the third sample was taken 37 minutes after the run had started; the fourth sample was taken 42 minutes after; the fifth sample 57 minutes; the sixth sample 72 minutes; the seventh sample 77 minutes; the eighth sample 121 minutes; the ninth sample five hours and three minutes; the tenth sample eight hours; the eleventh sample, eleven hours and fifty-five minutes. This was the final sample.

Q. 150. Have you and can you produce some of these samples, K-1 and so forth?

A. We have all these samples in a filtered state; I produce them.

595 Q. 151. Will you look at these samples and see if they are all present?

A. Sample- K-9 and K-10 are missing, due to the fact, if I remember, that those two samples were very small; merely to get an approximation as to the final melting point.

Q. 152. But these samples which you have produced are samples of the material which you have indicated as K-1, K-2 and which was drawn from the hydrogenator from time to time as you have described?

A. Yes.

Q. 153. And what is the bottle marked K-0?

A. K-0 is the cotton seed oil with which we started this operation.

Q. 154. And these samples have had the catalyst filtered from them?

A. Yes.

The Court: Do you produce this merely to show that it is all a question of degree and there is practically no disclosure in the patent?

Mr. May: Yes, sir; that is one phase of it; purely a matter of the practice of the Kayser process; that the reaction is a gradual progressive reaction.

I offer this series in evidence.

Marked Defendant's Exhibit J-1.

Q. 155. Have you the corresponding samples K-1 and K-2 and so forth, as they were drawn from the hydrogenator and before they were filtered, and from which the samples in Exhibit J-1 were produced?

A. We have most of them, I believe. We have all the samples that are represented in the filtered series in the unfiltered state.

Mr. May: I will have a rack made in which these will be placed together. In the meantime I will have them put into this
596 box, and I will offer them in evidence.

Marked Defendant's Exhibit K-1.

Q. 156. In answer to question 41, you referred also to carrying on the hydrogenation of oil in a simple form of apparatus comprising a stoppered flask having two tubes in it, one for the introduction and the other for the emission of the hydrogen. Did you carry on the hydrogenation of cotton-seed oil with this apparatus also, while plaintiff's counsel and experts were present?

A. We carried out a hydrogenation in this same type of apparatus at the same time these witnesses were present.

Q. 157. I neglected to ask you one question which I will now ask you; in making the K run what catalyst did you use?

A. We used the same catalyser that we used in making the L run.

Q. 158. In the run which was carried on in using the simple form of apparatus consisting of the flask, what catalyst did you use?

A. In that experiment we used a catalyser made by reducing nickel oxide by means of hydrogen at an elevated temperature.

Q. 159. And that catalyser was prepared before plaintiff's counsel and experts reached Berlin?

A. Yes; that catalyser was prepared before they came to Berlin.

Q. 160. You said in answer to question 41 that the flask was submerged in an oil bath. What was the purpose of this?

A. The purpose of this was to assure a uniform temperature within the flask which contained the oil to be hydrogenated and to heat this oil in the same flask.

Q. 161. That is to say, you heated the flask and its contents by means of an oil bath?

A. Yes, sir.

597 Q. 162. And the oil bath itself was heated?

A. By an electric wire.

Q. 163. An electric heating element contained in the oil?

A. Yes.

Q. 164. Did you succeed in hydrogenizing oil in this apparatus?

A. We did.

Q. 165. How large was the flask?

A. The flask had a capacity of about 2 litres.

Q. 166. And what was that run called?

A. That run we called N.

Q. 167. Were samples taken from time to time from that flask during the process of hydrogenizing?

A. Samples were taken from time to time and the melting points determined.

Q. 168. How did you observe the temperature of the oil?

A. The temperature of the oil was observed by reading the temperature of the oil bath.

Q. 169. And how did you read the temperature of the oil bath?

A. By means of a thermometer submerged in it.

Q. 170. Will you give a list of the samples that were withdrawn

from time to time during this N run, and also give their melting points?

A. The samples were designated as N-1 up to N-8, the melting points from A on the N-6, N-7 and N-8 samples, and are 31.6 centigrade, 34.1 centigrade and 36.6 centigrade, respectively.

Q. 171. How did you carry on the hydrogenization of cottonseed oil, with any other form of apparatus at that time?

A. We did.

Q. 172. Describe that apparatus, if you please?

A. This hydrogenization was carried out in a vertical pipe about 4 inches in diameter, about 4 feet high. This pipe was wound with nichrome wire and heated electrically by means of this wire.

598 Within the pipe we had a catalyser, consisting of nickel deposited on pumice stone. This catalyser was made by soaking pumice in a nickel nitrate solution, then calcining the material and finally reducing this pumice with the nickel oxide upon it, in the apparatus in question at a temperature from 275 to 285 degrees centigrade. The top of the vertical pipe was provided with two openings, one for the introduction of the oil to be hydrogenated and the other for the introduction of the hydrogen. The bottom of the apparatus was provided with similar openings, one for the oil leaving the apparatus and the other for the excess hydogen leaving the apparatus. The apparatus was provided with a thermometer cup and the thermometer to read the temperature of the oil during that process.

Q. 173. Where was the hydrogen introduced?

A. The hydrogen was introduced at the top.

Q. 174. Where was the oil introduced?

A. The oil was introduced at the top.

Q. 175. Have you a photograph to illustrate the apparatus that you have described?

A. I have. I produce substantially the apparatus in question. In the photograph we have pictured also a circulating pump by means of which the hydrogen might be circulated through the apparatus continually. In this experiment in question we did not use this circulating pump, allowing the hydrogen to stream in through the top, the excess leaving the bottom without being re-circulated. The apparatus as it stands is substantially the same apparatus we used in this experiment.

Mr. May: I offer in evidence the photograph of apparatus used in the Bedford-Williams process.

Marked Defendant's Exhibit L-1.

599 Q. 176. In order to distinguish that apparatus you called it the Bedford apparatus?

A. The B run.

Q. 177. The Bedford-Williams apparatus?

A. Yes.

Q. 178. And that run with the Bedford apparatus was distinguished by the name B?

A. Yes, sir.

Q. 179. Will you please describe that operation and state whether or not samples were taken from time to time of the material which had been passed through the apparatus?

A. Both the cotton-seed oil and the hydrogen used in this operation were passed in through the top, the temperature being regulated by means of the induction coil and switches. The oil and hydrogen passed down through the apparatus, the oil being caught in a flask at the bottom, and the hydrogen allowed to escape without allowing the leakage of air into the apparatus. Samples were taken under different conditions, these different conditions being a varying rate of oil through the apparatus. The samples were taken to the laboratory and the melting points determined on them.

Q. 180. And what were the samples taken from that apparatus indicated as?

A. B-1, B-2 and so forth.

Q. 181. Will you please give the melting point of these various samples, B-1, B-2, and so forth? I wish you would just read the number of the sample and then give the melting point?

A. B-1—54.2 degrees centigrade.
B-2—55.1 degrees centigrade.
B-3—51.8 degrees centigrade.
B-4—50 degrees centigrade.
B-5—48.3 degrees centigrade.
B-6—46.2 degrees centigrade.
600 B-7—50 degrees centigrade.
B-8—51.3 degrees centigrade.
B-9—52.6 degrees centigrade.

Q. 182. I observe you give the first two samples as having a relatively high melting point. How did that happen, if you know?

A. I explain that in this way: The oil on first being introduced into the apparatus must consume some time in reaching the bottom. We did not attempt to control the rate within very narrow limits, and it appears we did not run the oil through fast enough to obtain lower melting points. Later in the run we allowed the oil to run through at a faster rate and obtained lower melting points.

Q. 183. So that the melting points of these samples depended upon the rate at which the oil was passed through the apparatus?

A. Yes, sir.

Q. 184. Have you copies of the notes that you made respecting these various operations that you have described?

A. We have a copy of these notes and the sketches. I produce a copy of the notes taken at the time, upon which I have sketched the apparatus that was used in carrying out these processes.

Mr. May: I will offer these notes in evidence and sketches, relating to the apparatus and processes used in making the several tests about which the witness testified.

Marked Defendant's Exhibit M-1.

Q. 185. Do you know whether or not a copy of these notes were sent to plaintiff's counsel or experts?

A. Several copies of these notes were made, and it was my
601 direction to send a copy of these notes to plaintiff's counsel. As far as I know this was done.

Mr. May: The plaintiff's counsel says that they never were received. It was intended they should have copies of these notes. However, they have notes which they made at the time themselves, which I understand correspond substantially to these notes.

Q. 186. Was any other method of hydrogenization carried on at the Berlin Mills Research Laboratory on November 27th and 28th?

A. Yes, there was another method of hydrogenization carried out under the direction of Dr. Bacon.

Q. 187. And you did not carry on that experiment?

A. I had nothing to do with this experiment.

Q. 188. What was that particular run called, if you remember?

A. We called this run the Paal and Roth run.

Q. 189. In the regular course of your duties at the research laboratories you have occasion to see the operation of the defendant's apparatus and process in the manufacture of its product from cottonseed oil?

A. Yes, sir; daily.

Q. 190. Dr. Walker was asked on cross examination as to whether or not this apparatus would, by slowing down the flow of oil, produce a product approximating in hardness the specimen. Plaintiff's Exhibit No. 3, and as I understood him, he said in part that he could not say from experience. Have you had such experience with defendant's apparatus and process as would enable you to state whether or not such a product could be produced by defend-
602 ant's apparatus?

A. We have found that it is impossible to produce a fat from this cottonseed oil having an iodin number lower than 80. In other words, we are not able to produce a fat of that consistency. This fat produced with an iodin number of 80 would not have this hardness.

Q. 191. That is to say, it would not have the hardness and consistency of Plaintiff's Exhibit No. 3?

A. Yes, sir.

Q. 192. Have you ever, in point of fact, produced by defendant's process a product or fat from cottonseed oil having an iodin value of 80?

A. By the defendant's process we have not been able to produce a fat having an iodin number lower than 80.

Q. 193. You have produced a fat having an iodin number of 80?

A. Yes, sir.

Q. 194. Can you give the melting point and the titer of fat having that iodin value?

A. The melting point of a fat produced by the defendant's process and having an iodin number of 80 has a melting point of 42.8 degrees centigrade and a titer of 40.2 centigrade.

Q. 195. You produced on Friday the samples of the same material which you have previously referred to as L-6 and L-7, but which were aerated, and were marked in evidence Exhibits C-1 and E-1. When did you aerate these samples?

A. Last Tuesday.

Q. 196. How did you do it?

A. This was done by taking the fat directly and rubbing this fat in an ordinary pharmaceutical mortar by means of a pestle for five or ten minutes, in this way incorporating air with the fatty mass, thus softening it by means of the churning and the air.

603 Q. 197. You have stated that defendant's product, such as the sample produced by plaintiff and referred to in stipulation, Plaintiff's Exhibit No. 2, was produced by hydrogenizing cotton-seed oil having an iodin value of 107.7. In that sample of defendant's product what percentage of additional hydrogen more than in the starting or original oil does that sample contain?

A. .875 per cent. or a little less than .9 of one per cent.

Q. 198. Starting with a cotton-seed oil having an iodin value ranging from 108 to 110, what percentage of additional hydrogen more than in the original oil would there be in the hydrogenated product having an iodin value of 80?

A. I figured this and found it to be 2.04 per cent.

Q. 199. And suppose that you started with the same cotton-seed oil, and then what percentage of additional hydrogen more than in the original oil would there be in a hydrogenated product having an iodin value of 55?

A. I have figured this also and find it to be 3.75 per cent.

Recess.

(After Recess.)

GEORGE A. RICHTER, resumes the stand.

Direct examination.

By Mr. May (continued):

Q. 200. How did you happen to produce from cotton-seed oil by defendant's apparatus and process that product which you said had an iodin value of 80?

A. We were interested in determining just how low an iodin number we could realize by defendant's process and carried
604 out a series of experiments with this object in view. We found that 80 appeared to be the minimum iodin number which we could realize.

Q. 201. Have you analyzed from time to time defendant's product produced by defendant's apparatus and process by the addition of hydrogen to cotton-seed oil?

A. Yes; I have.

Q. 202. Will you please state the range in iodin value of defend-

ant's product produced, say, between March, 1915 and January 1st, 1916?

A. The iodin number in that period ranged from the lowest value on record of 83.8 up to the highest value on record of 94.7.

Q. 203. Can you give me also the range of the iodin value of the liquid fatty acids during that same period?

A. The iodin value of the liquid fatty acids varied from 134 up to 137.5, as far as our records show.

Q. 204. Can you give the range of the melting points of that same product during the period inquired about?

A. During that same interval our melting points ranged from 33.9 Centigrade to 46.6 Centigrade.

Q. 205. Can you likewise give the titer of that product during that same period?

A. I would have to give that offhand; if I remember correctly it ranges from about 33.4 up to 36.5.

Q. 206. You are giving that, however, from recollection?

A. That is offhand; yes.

Q. 207. Do you know when defendant's product produced by the hydrogenation of cotton-seed oil was first placed upon the market?

A. Yes; we placed this on the market first in September, 1914.

Q. 208. In what quantities was that product produced prior to March 1st, 1915?

605 A. The production was quite rapidly increased and by March, 1915, we were producing between one and two tons of product daily.

Q. 209. Speaking generally, to whom were these products sold from the time they were first placed upon the market throughout the period inquired about?

A. They were sold both as soap stock to soap manufacturers and as a food product.

Q. 210. Was there any difference in these products so far as the process of hydrogenizing them was concerned?

A. No.

Q. 211. No difference in the temperature by which they were produced?

A. No.

Q. 212. And they were hydrogenized in the same apparatus and under the same conditions as to temperature, and so forth?

A. The same apparatus was employed and the same conditions including temperature during the hydrogenation was employed.

Q. 213. What was the difference between the product that you sold to soap makers and those that you sold to the food trade?

A. The product that we sold to soap makers consisted of a product which we obtained during a period within which we had not obtained an optimum temperature control of our chilling roll and also a suitable speed of the picker. In other words, the product that we sold to the soap makers was a product which was put out in a form which did not approximate the same appearance as the product we sold to the food trade due to the picking and the chilling.

Q. 214. But so far as edibility was concerned was there any difference between those products?

A. Not a particle.

Q. 215. One could be used for shortening or frying just as well as the other?

A. We have used both indiscriminately.

606 Q. 216. When defendant's product produced by the hydrogenation of cotton-seed oil is permitted to cool after being drawn from th de-odorizer and is not chilled by the refrigerating rolls does it have the appearance of the same product that has been passed through the chilling rolls?

A. No, sir; the product obtained by allowing this hydrogenated oil to cool slowly in a pail or any other receptacle invariably separates out in two parts, one an oily constituent and the other a solid, this oil floating on the top.

Q. 217. That happens you say when the material is drawn from the de-odorizer and is merely permitted to cool to atmospheric temperature?

A. To room temperature.

Q. 218. Now, when the product has thus been permitted to cool without being refrigerated by means of the refrigerating rolls is it homogeneous physically?

A. No.

Q. 219. In your experience have you ever noted in defendant's product produced by the hydrogenation of cotton-seed oil any material having the proportions of the component glycerids falling within the following range, to wit; saturated glycerids 20 to 25 per cent.; olein 65 to 75 per cent.; and linolin 5 to 10 per cent.?

A. We have never produced such a product by defendant's process.

Q. 220. Have you ever tried to produce such a product by means of defendant's process and apparatus?

A. Yes; many times.

Q. 221. What resulted from your trial?

A. The result invariably leads to this; the product obtained contains a large percentage of stearin; a relatively large per cent. of linolin and the olein content of the original oil does not change very appreciably. In other words, by varying different factors in

607 this process we are not able to realize the product which is stated in your question.

Q. 222. Can you give the range of the percentage of component glycerids which you have noted in defendant's product produced by the hydrogenation of cotton-seed oil?

A. Yes. This range of composition is approximately as follows; I cannot give you the absolute statement there but this is relatively true;

The saturated fats including all saturated components varies from 28 to 32.4 per cent.; the olein varies from 34.3 to 37 per cent., and the linolin from 33.3 to 37.7 per cent.

Q. 223. Have you ever tried to produce such a product as last prescribed by you; that is, having the range of percentages of component glycerids that you have given, by means of a process and apparatus such as is used in producing the samples L-5 and L-7. Defendant's Exhibits A1 and B1?

A. Yes; we tried the same process very many times but we have never succeeded in obtaining a product even approximating the composition mentioned.

Q. 224. Have you ever tried to produce a product having from 20 to 25 per cent. saturated glycerids; 65 to 75 per cent. of olein and 5 to 10 per cent. linolin by agitating oil in a closed vessel in the presence of an atmosphere of compressed hydrogen maintaining in suspension thereby a catalyst consisting of finely divided nickel carried by a kieselguhr, raising the temperature approximately to about 155 degrees centrigrade, carefully regulating and limiting the admission of hydrogen and withdrawing the product when the oil has been converted to a product having a melting point of from 36 to 43 degrees centigrade?

A. I tried many times to produce this same product under
608 those conditions mentioned, and I have never been able to do so.

Q. 225. In carrying out the two runs which you have referred to as K and L at the research laboratory on November 27th and November 28th, 1916, you say that you observed that the reaction took place progressively or gradually and the oil was gradually increased in hardness as the reaction proceeded?

A. Yes.

Q. 226. Was there any sharp or critical point in that reaction?

A. No, sir.

Q. 227. In Mr. Richardson's deposition he gave the percentages of the component glycerids of lard as follows:

40 to 42 per cent. saturated glycerids; 48 to 50 per cent. olein and 8 to 10 per cent. linolin.

Will you please locate on chart No. 403 such a fat?

A. I do so.

Q. 228. Please run a line out and mark that "lard"?

A. I have done so.

Q. 229. I understood Mr. Morrison to give the percentage of average Crisco of 27.3 saturated fat; 72.9 olein and 19.8 linolin. Please locate such a fat on chart 403.

A. I have done so.

Q. 230. Please indicate that on the chart as "Crisco"?

A. I have done so.

Q. 231. Now, please be good enough to locate on the same chart No. 403 a fat having the following percentages of component glycerids: 20 to 25 per cent. saturated fats; 65 to 75 per cent. olein and 5 to 10 per cent. linolin.

A. I have done so.

Q. 232. Just mark what percentages that location represents?

A. I have done so.

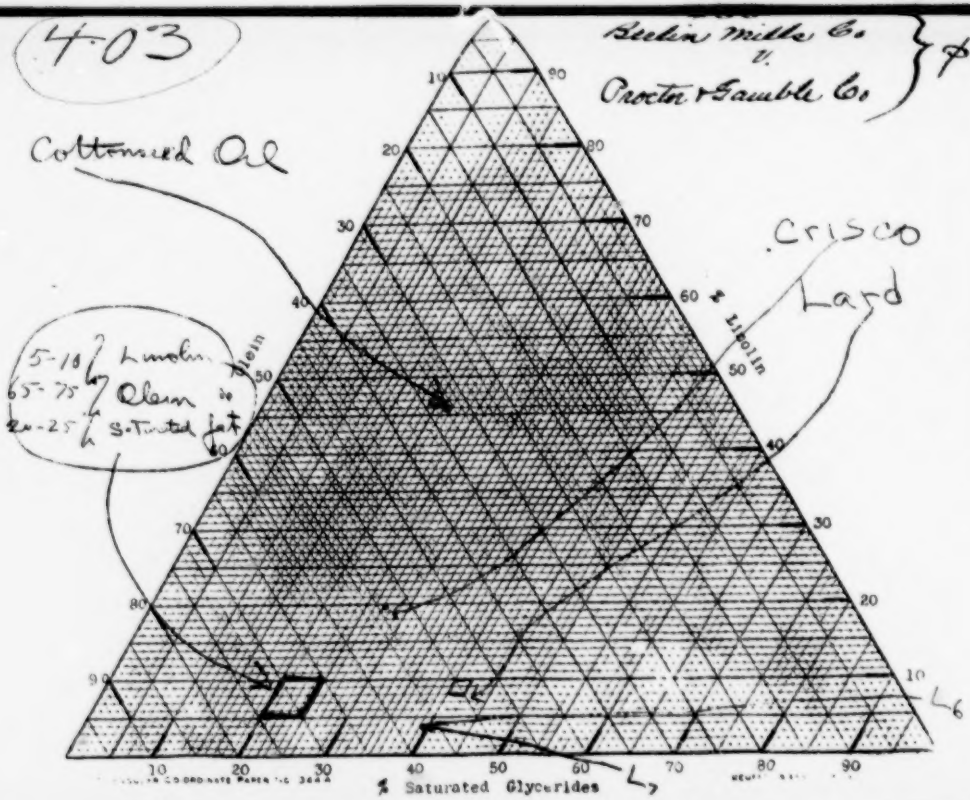
Q. 233. Will you please also locate upon the same chart the cottonseed oil having 21.5 saturated glycerids; 32.5 olein and 46 linolin?

A. I have done so.

(Here follows diagram marked p. 608½)

403

Berlin Mills Co.
v.
Procter & Gamble Co. } ₱608



609 Q. 234. Please be good enough to mark that cotton-seed oil.
A. I have done so.
Q. 235. You made reference to an experiment that was carried on at the research laboratory in November, 1916, when plaintiff's counsel and experts were present, as the Paal and Roth experiments. Did you have notes made or did you make notes as to that experiment at the time?
A. Yes.
Q. 236. And have you furnished copies of those notes to Dr. Bacon?
A. Yes.
Q. 237. I will just ask you whether or not you recognize these notes as being the same?
A. Those are the same.
Q. 238. This is a copy of the same notes you furnished Dr. Bacon?
A. Yes.

Mr. May: I will have this marked for identification.

Marked Defendant's Exhibit N-1 for identification.

Cross-examination.

By Mr. Gifford.

X Q. 239. These notes marked for identification Defendant's Exhibit N-1 are the only notes that you took at that Paal and Roth experiment?
A. In Berlin?
X Q. 240. Yes, in Berlin.
A. They are a copy of the original notes.
X Q. 241. Are these the only notes you took?
A. You mean whether another set was taken? I believe plaintiff's counsel took their own notes but I took only one set of notes.
X Q. 242. These notes marked for identification, do they show the melting points?
A. I do not think so.
X Q. 243. Why did you not take the melting points?
A. We were not so directed by our counsel.
610 X Q. 244. Do you know who took the melting points on your side of the case?
A. No.
X Q. 245. What became of the samples that were made there?
A. The Paal and Roth samples?
X Q. 246. Yes.
A. I do not know whether we have them or not; if we have them do you wish to see them?
X Q. 247. I would like to know where they are.
A. They are here.
X Q. 248. Referring now to the N run experiments, I notice that you did not produce the specimens resulting from that experiment?
A. No.

X Q. 249. Have you them here?
A. Yes.
X Q. 250. Will you please produce them.
A. Yes; these samples are necessarily smaller than the others, due to the size of the apparatus.
X Q. 251. These samples, of which there are eight, are marked consecutively from N-1 to N-8 inclusive, are they not, on the labels?
A. Yes.

Mr. Gifford: I will ask to have these marked for identification.

Marked Plaintiff's Exhibits 6 to 13.

X Q. 252. Have you the samples produced by the B run?
A. Yes, we have those also.
X Q. 253. I will ask you to produce those.
A. I produce them.

Mr. May: Defendant's Counsel offers in evidence the samples that were produced by the witness.

Marked Defendant's Exhibits O-1 to U-1 inclusive.

X Q. 254. Are these samples marked B-1 to B-9 inclusive?
A. Yes, sir.
611 X Q. 255. There being two sets of them as I understand it, one set being filtered and the other set unfiltered?
A. Yes, sir.
X Q. 256. Were you present at any other experiments made in connection with this case, where both sides were present?
A. I was present at another series of experiments where counsel for both the defendant and plaintiff were present.
X Q. 257. Those were made at the Mellen Institute?
A. Those were made at the Mellen Institute at Pittsburgh.
X Q. 258. Under whose direction?
A. Dr. Bacon's.
X Q. 259. You have expressed the opinion that the specimens produced by you, L-6 and L-7, are edible. Have you ever eaten any of them?
A. Yes, sir.
X Q. 260. How much of them did you eat?
A. Half a teaspoonful.
X Q. 261. Is that all?
A. Why, I think so.
X Q. 262. Did you simply eat them as they were without cooking with them or anything of that kind?
A. Yes, sir.
X Q. 263. When did you do that?
A. Oh, several months ago; probably two months ago. I might add that these samples have been tasted many times during that interval, in small amounts varying from half a gram up to two grams at a time. We have actually made pastry and cake and pie with samples that are very similar, not from this identical run but from samples

made in the very same way, and they all proved edible; not only edible, but could not be distinguished from refined products used for shortening at the same time.

X Q. 264. I am asking you what you have done personally?

A. This was done by me personally and by my direction in our laboratory.

612 X Q. 265. Have you any specimens of those experiments to produce here?

A. Of the pastry and the cake you mean?

X Q. 266. Of the pastry and cake?

A. The only exhibit I can make is a cake which we made at Mellen Institute which Dr. Bacon can testify for later on.

X Q. 267. I am asking you what you made at your factory and that you just spoke of a moment ago?

A. I have no sample of pastry made in my laboratory with me.

X Q. 268. So that the only thing that you have produced here representing L-6 and L-7 or any product produced from those is what you have produced here and put in evidence?

A. Yes, sir.

X Q. 269. In making your chart No. 403, you have, as I understand you, noted the position of cottonseed oil, on the assumption that it contained 21.5 saturated fat?

A. Yes, sir.

X Q. 270. What does that saturated fat consist of?

A. Stearin, palmitin, probably a trace of the corresponding ester of arachidic acid. I do not know about that, though.

X Q. 271. What are the proportions of stearin and palmitin, respectively?

A. I do not know.

X Q. 272. You have heard Mr. Richardson say that the proportion of stearin was as low as two per cent., haven't you?

A. Yes.

X Q. 273. Have you any fault to find with that statement?

A. I have never done any work along the line of determining whether cottonseed oil contained two per cent. or ten per cent. of stearin. I do not know.

X Q. 274. Assuming that defendant's witness Richardson was correct, then the saturated fat contained in the cottonseed oil located by you on the chart would consist of palmitin, what per cent.?

613 A. 19.5 per cent., assuming his statement to be correct. That statement is also assuming that we have in the original cottonseed oil no corresponding ester of an acid of the olein group which corresponds to the palmitin group. I do not think we have any evidence to show there is such an ester present. As far as I know we have not.

X Q. 275. To the best of your knowledge then, the saturated fats contained in this cottonseed oil located by you on the chart 403 may contain two per cent. stearin and 19.5 palmitin?

A. As far as I know. I might add that as far as that chart is concerned it does not make any difference whether all the saturated fat there is in the form of palmitin or not.

X Q. 276. What is the difference in formula between stearin and palmitin?

A. The stearin includes the acid of the C_{18} group and the palmitin contains the acid of the corresponding C_{16} group.

X Q. 277. Please give the formula of each?

A. $C_3H_5(C_{18}H_{35}O_2)_3$ $C_3H_5(C_{16}H_{35}O_2)_3$.

X Q. 278. By what do they differ?

A. They differ by 2 CH_2 groups.

X Q. 279. And what would be the molecular weight of 2 CH_2?

A. 28, as far as the acid itself is concerned.

X Q. 280. By what do the formulas of linolin and olein differ?

A. By two hydrogens. Are you referring to the acid or the ester?

X Q. 281. I am referring to the acid.

A. Two linolic acid and two oleic acid. By two hydrogen atoms.

X Q. 282. What is the molecular weight of two hydrogen atoms?

A. Two.

614 X Q. 283. In "Kream Krisp," what do the saturated fats consist of?

A. Palmitin and stearin.

X Q. 284. And assuming that the "Kream Krisp" is made from a cottonseed oil containing saturated fats 21.5 per cent., olein 32.5 per cent. and linolin 46 per cent., what would be the percentage of saturated fat added to it in making "Kream Krisp"?

A. The percentage of saturated fat based upon what original oil or percentage of saturated fat already in the oil?

X Q. 285. State it both ways.

A. You assume a saturated fat content of 21.5 per cent?

X Q. 286. Yes, in the cottonseed oil?

A. Based on the oil, that increase would be 10.9 per cent.; based on the saturated fat in the oil it would be 50.7 per cent.

X Q. 287. What "Kream Krisp" are you figuring on?

A. That is "Kream Krisp" assuming a saturated glycerid content of 32.4. Of course the saturated glycerid content of "Kream Krisp" varies somewhat.

X Q. 288. And what is the added saturated fat, whether stearin or palmitin?

A. Probably all of stearin, although, as I indicated before, if there is any hypogaeic acid present in the original oil you would get some palmitin form to correspond with that particular amount.

X Q. 289. The analysis that you first gave of "Kream Krisp" I think was 28 per cent. of saturated fats. Please state what addition of saturated fats this represents to that contained in the original cottonseed oil from which it was produced?

A. 6.5 per cent.

X Q. 290. And this addition would be all stearin and no palmitin, as I understand you?

A. Qualifying my statement as I did before.

615 X Q. 291. With that qualification, yes?

A. I think so.

X Q. 291*a*. So that the 28 per cent. of saturated fat in "Kream Krisp" would consist of 21.5 per cent. of palmitin in the original

cottonseed oil, plus 6.5 per cent. of stearin added by the hydrogenizing process?

A. No. You are neglecting even the two per cent. that Dr. Richardson mentioned of stearin in the original cottonseed oil.

X Q. 292. I forgot that for the moment.

A. I assumed that in answering.

X Q. 293. State what the 28 per cent. would, in your opinion, consist of.

A. 19.5 per cent. palmitin and the balance stearin.

X Q. 294. The stearin being made up of the two per cent, assumed to be present in the original cottonseed oil, and how much added?

A. 6.5 per cent.

X Q. 295. Do you know what are the solubilities respectively of palmitin and stearin in linolin?

A. No, sir.

X Q. 296. Do you know what the solubility of either of them is in linolin?

A. By solubility do you mean the per cent. of palmitin which may be mixed with linolin and still have a liquid phase?

X Q. 297. That is what I mean.

A. No, I do not.

X Q. 298. Do you know the solubility of either palmitin or stearin in olein?

A. No, sir.

X Q. 299. Do you know the solubility of either palmitin or stearin in a mixture of linolin and olein?

A. No, sir.

X Q. 300. Where you have marked stearin on the chart 402 it should be correctly "stearin plus palmitin," should it not?

A. I should call it saturated fats, rather than stearin plus palmitin.

616 X Q. 301. Consisting of stearin and palmitin?

A. At least those two, yes.

X Q. 302. If to the liquid mixture of linolin and olein a given amount of palmitin be added, would the melting point be the same or different from that obtained by adding the same amount of stearin?

A. To the same mixture of liquid acids?

X Q. 303. To the same mixture of liquid acids.

A. It would be different, presumably. I do not happen to know which of those two has the greater effect as far as solidity goes, but I should suspect off-hand that they would be quite different.

X Q. 305. And I suppose you would suspect off-hand that there would be quite a difference between the effect produced by adding to the liquid a mixture of palmitin and stearin from that produced by the addition of either one separately?

A. I should say there that it would depend entirely upon the proportions you added. I can conceive of a possible mixture whereby you might add certain proportions of stearin and palmitin and get the same effect as to solidity as you might if you added only one of those components. In other words, if you care to go into detail, it

is a matter of melting point curve, considering palmitin and stearin together.

X Q. 306. But the addition of palmitin would have a different effect so far as the melting point is concerned from the addition of stearin to the same linolin and olein liquid?

A. As far as I know, yes. I do not know absolutely.

X Q. 307. Do you know what the melting point would be of equal parts of linolin, olein and palmitin, mixed together?

A. That would depend upon the source of each of your three ingredients, as far as I can tell. In other words, you could not
617 predict directly, knowing the ultimate analysis, without knowing the kind of oil you had in consideration, the type of oil, and how each of those ingredients was added, whether the ingredients there were mixed glycerids or simple glycerids.

X Q. 308. What do you mean by mixed glycerids and what do you mean by simple glycerids?

A. I think Dr. Walker gave a very good explanation of a mixed glycerid the other day. A mixed glycerid consists of a glycerine radical in which the substitution is made by more than one acid. In other words, instead of having three oleins or three stearins or three palmitins connected with one glycerine, you may have two of one and one of another, or three entirely different acids, attached to the same glycerine molecule. A tri-glycerid means that the glycerine has attached to it three acid radicals of the same acid.

X Q. 309. To simplify the matter as much as possible, suppose we represent the glycerine radical by G and the fatty acids respectively by L, O and P, might one of the tri-glycerids in cottonseed oil be represented as I have sketched on this paper, thus G-L-O-P.

A. Theoretically, yes. I do not know whether there is an actual glycerid existing of that type, but theoretically that could exist. In other words, I do not know whether there is a lino-oleopalmitin.

X Q. 310. Using this form of notation, will you please write on this paper some one or more of the forms of tri-glycerids that you understand to exist in cottonseed oil?

A. Are they tri-glycerids or a mixed glycerid?

X Q. 311. I mean to say a mixed glycerid?

A. I do not know that there is any. I am not sure of any of them existing in cottonseed oil. Theoretically I do. I do not
618 know whether they do. I do not know how you would determine the presence of a mixed glycerid in cottonseed oil, quantitatively or otherwise.

X Q. 312. The formula that I have drawn above, then, represents the mixed glycerid in cottonseed oil, if it exists there, as well as any that you can draw?

A. If it exists there, yes.

X Q. 313. In other words, speaking theoretically, this formula that I have drawn represents it as well as any that you can draw?

A. Well, speaking theoretically, that mixed glycerid as you have drawn it could be a possible constituent of cottonseed oil. I do not know whether it is there. I do not know whether anyone has ever determined it.

X Q. 314. In cottonseed oil do you understand that any simple glycerids exist?

A. I think there are.

X Q. 315. What?

A. Probably tri-palmitin and probably tri-stearin.

X Q. 316. Using the notation that I have used above, please write the formula of each of those?

A. (Writing) G-P-P-P-G-S-S-S.

X Q. 317. Are there in your opinion any unsaturated simple glycerids in cottonseed oil?

A. You are referring to the tri-glycerids, again, or the simple glycerids? I could not say. I do not know.

X Q. 318. As I understand it, the two formulæ that you have given above for the glycerids of cottonseed oil are both saturated?

A. That does not necessarily mean that all the glycerids in cottonseed oil are saturated. My conception of these last two formulæ is that I see a possibility and a probability of their existing in cottonseed oil some tri-palmitin and some tri-stearin. As for the rest of the constituents I have not referred to them.

X Q. 319. That is what I am asking you now. Are there any unsaturated simple glycerids in cottonseed oil?

A. I do not know.

619 X Q. 320. There are unsaturated mixed glycerids, are there?

A. Probably. I cannot vouch for the liquid glycerids. I have reason to expect tri-palmitin and tri-stearin from experimentation. I have done no experimentation along the lines of determination along the lines of determining the presence of simple tri-linolin or simple tri-olein; therefore I am in no position to say anything about them.

X Q. 321. What are the glycerids in cottonseed oil that you think are changed by the hydrogenizing operation?

A. The glycerids that contain the linolin and the olein groups.

X Q. 322. Are they simple or mixed?

A. They may be both; I do not know. In other words, in analyzing a cottonseed oil one cannot determine whether the olein and the linolin and the saturated glycerids are there as mixed glycerids or as simple glycerids by the iodin number, liquid fatty acid methods. The analysis there leads us directly back to the ultimate analysis and the results are expressed in terms of linolin, olein and saturated fat, regardless of the method by which they are combined intermolecularly. It is the same case as when one analyzes a solution or a rock for iron. One does not know necessarily that iron there is as iron silicate or iron carbonate or anything else, but generally one expresses it as FEO, or iron oxide, arbitrarily.

X Q. 323. Have you any authority for the statement that any simple glycerid exists in cottonseed oil?

A. No, I have no authority.

X Q. 324. You stated in your direct examination that you had applied the Halphen test to "Kream Krisp" and the only specimen

to which you ever applied it showed negatively was the sam-
620 ple in evidence. How frequently have you applied that test to "Kream Krisp" since you have been with the Defendants?

A. There is a misunderstanding. I do not believe I said that.

X Q. 325. What did you say?

A. I said that we have applied the Halphen test to "Kream Krisp" very many times, and that the first sample that we ever received or tested to show a negative result was a sample that Mr. May forwarded to us.

X Q. 326. How does that differ from my question?

A. You stated in your question that I have never obtained a negative Halphen test from the "Kream Krisp."

X Q. 327. I said excepting from this sample in evidence.

A. There is a difference there. There is a tremendous difference.

X Q. 328. Have you obtained negative results with that test on any other samples of "Kream Krisp" besides the one in evidence?

A. After we tested this sample in evidence and found a negative Halphen test we went back over our old samples, stored away for two or three years, and recovered sever l or very many samples, and tested each one independently and individually for the Halphen test in the same way. In that large series we found two or three to have shown negative Halphen tests, but of all the Halphen tests we have ever made we have found in all, I think, three, including this sample that showed a negative Halphen test. In other words, these tests which we made and showed the negative Halphen test outside of this sample in evidence here were made after we discovered this bare possibility in this sample presented.

X Q. 329. How long have you been with the defendant?

A. Since July, 1914.

X Q. 330. To what extent have you been accustomed since
621 that time to test with the Halphen test the output of the defendant's factory?

A. Very many times?

X Q. 331. How frequently?

A. It was done probably four or five times a week.

X Q. 332. And how much did you test at that time?

A. Each sample represents a very large batch, maybe two days' output. In other words, if one sample shows a positive Halphen test it is fair to not only assume but to know that the rest of that batch will also show a positive Halphen test.

X Q. 333. And you have done that right along ever since you have been here?

A. Very many times. I have not done all these personally, but they have all been done under my direction and observation.

X Q. 334. You have stated also that in the use of the defendant's process you have never known any iodin value to be produced lower than 80. I find that the Moore patent, No. 1,121,860 which has been put in evidence by the defendant, as the patent for defendant's apparatus or process, says:

"By regulating the oil supply I am able to regulate the degree of

solidity of the hydrogenated product to any pre-determined point according to the use for which it is intended."

And also it says:

"It is unnecessary with my process to pass the oil through the diaphragm more than once, but of course should the hydrogenation be not so complete as desired for any cause, it may be circulated through the spray nozzle and diaphragm by a pump and suitable pipe connections."

Do you not understand that the lower iodin value than 80
622 may be attained in the defendant's apparatus by these means?

A. He may have had another oil in mind and a lower iodin number to start with.

X Q. 335. Do you not understand that in the defendant's apparatus any degree of hydrogenization below an iodin value of 80 may be attained in the manner stated in this Moore patent?

A. No, sir; it depends on the type of oil.

X Q. 336. This Moore patent, as I understand it, shows that if the hydrogenation is not as complete as desired the oil may be passed again through the apparatus?

A. Yes.

X Q. 337. In that manner do you mean to say lower iodin value than 80 cannot be attained?

A. Using that process in circulating product through and through the diaphragm you may reach a product of 55, but that is not the process as practiced by the Berlin Mills Company, and never has been. We carried on a set of experiments with that object in view, to determine the lowest possible iodin number which one might obtain by passing the oil through the diaphragm, such as is practiced. That set of experiments demonstrated very fully and very definitely that the lowest iodin number that could be realized was 80. We carried on another set of experiments to determine the other factor, namely the effect of passing that oil through the catalyser several times, and we did this just as often as the hardness of the oil would permit. Our final figure was 55. We also tried the same principle or rather tried to obtain the same result by varying the rate of flow through the diaphragm. By varying the rate of flow we found that we could not realize anything lower than that same value.

623 X Q. 338. I understand you in your direct testimony to have stated that an iodin value of 80 represents a 2.04 per cent. addition of hydrogen; am I correct?

A. No. The statement was not made in that form. The statement was made in this way—that assuming an oil with the iodin number of 107.7, and assuming that oil to be reduced to an iodin number of 80, the additional per cent. of hydrogen based on the hydrogen already in the oil is 2.04 per cent. by weight.

X Q. 339. Will you please state how you figured that out?

A. I can give you this quite in detail. The per cent. of hydrogen in the original oil with this iodin number of 107.7 is 11.55 per cent.

Knowing the per cent. hydrogen in the original oil and knowing the drop in iodin number from 107.7 down to 80, one can figure by direct proportion with the factor of 1.27 as the atomic weight of iodin, the corresponding amount of hydrogen, which is equivalent to that amount of hydrogen which is represented in the drop of iodin numbers during this process. This figure is 2.04 per cent.

X Q. 340. And will you state in the same manner how you figure .875 per cent. of hydrogen as the addition in making "Kream Krisp"?

A. This was figured in a similar manner. Assuming your oil at the start to be 107.7 and the "Kream Krisp" to have an iodin number of 94.7, which is the sample which the plaintiff has offered in evidence.

Cross-examination.

By Mr. Allen:

X Q. 341. Mr. Richter, in these tests at the Berlin Mills for the catalyst that was used in the flask method, producing the N run of samples, what was the temperature used in reducing the nickel oxide to nickel?

A. A temperature of from 300 to 400 degrees C.

624 X Q. 342. Was care taken in the temperature used?

A. Well, by care you mean were we trying to keep it within certain limits?

X Q. 343. Yes, that is what I mean.

A. Yes, broadly speaking.

X Q. 344. Unless the reduction is conducted carefully you are apt to get a nickel that is not sufficient as a catalyzer, are you not?

A. Do you mean by careful reduction that we must regulate very carefully the temperature?

X Q. 345. Not necessarily very carefully, but you have to see to it that you get a fine powder that is not melted together and that is not gray?

A. We have prepared nickel catalysers at temperatures varying from 275 degrees centigrade up to over 500 degrees centigrade, and have obtained active catalysers throughout that range.

X Q. 346. This particular catalyser that was used in this flask experiment, how was it kept before use?

A. Submerged in oil; covered with an oil layer.

X Q. 347. How long had it been made before we got there?

A. Two days, I believe.

X Q. 348. Why was it submerged in oil?

A. To preserve its activity. In other words, an active catalyser when exposed to the air is very apt to lose its activity, and to prevent that as much as possible we coat the surface of the catalyser with cotton-seed oil.

X Q. 349. Before we arrived at the Berlin Mills had any test been made of the catalyst to see that it was active and effective?

A. A qualitative test was made, run for about an hour, I believe, to see whether the preliminary hardening effect could be noticed,

but it was discontinued as soon as we saw that the catalyser was not inactive.

X Q. 350. Would you put it in that negative way, or until
625 you could see that the catalyser was active?

A. Well, I put it in that negative way for this reason: That one cannot tell by merely a short preliminary test whether a catalyser is really active in the commercial sense. One can tell whether that catalyser is absolutely inactive. In other words, we determined the fact that the catalyser was not inactive, although we did not carry the experiment far enough to determine whether it was really commercially or industrially active.

X Q. 351. Did the result of this experiment with this flask show that it was commercially active or not?

A. I do not think this flask experiment could be compared with commercial methods directly. In fact, I do not know very much of the commercial method of manufacturing fat with any similar type of apparatus. That is, I have never seen one worked personally, and I not know much about that; but this catalyser that we did have was active enough to demonstrate the principle that the oil could be hardened by this catalyser in question.

X Q. 352. You think the result of this flask experiment at Berlin Mills was what you would call a successful result of the hardening of cotton-seed oil?

A. Successful in the sense of hardening the cotton-seed oil by means of nickel catalyser and hydrogen and bubbling through the oil?

X Q. 353. Yes, hardening to a degree of hardness of say 50 or 52 degrees centigrade?

A. Yes, I think so. By that I mean that I believe this experiment indicated quite clearly that a catalyser could be reduced by means of hydrogen, assuming a nickel oxide, and that this catalyser could be submerged in oil and hydrogen bubble through this mixture and the oil hardened by this process.

X Q. 354. If you had carried this experiment on with the flask
long enough you would have gotten a product that was hard
626 to the extent of having a melting point of 52 or 53 degrees centigrade?

A. I do not know. We did not carry it on long enough for that. Probably not, with this particular catalyser.

X Q. 355. A great deal of hydrogen was used, was it not, in this experiment?

A. Yes, sir.

X Q. 356. Three flasks?

A. I have forgotten; two or three. The third one was started, I believe.

X Q. 357. Wasn't there a third one used up?

A. I could tell by my notes. My notes do not indicate that the third one was used up.

X Q. 358. I notice on the third page of the notes in the third line it says: "No further hydrogen bubbling." What does that mean?

A. That bubbling of the hydrogen was discontinued.

X Q. 359. You mean that you had discontinued it or that it merely stopped bubbling?

A. That we discontinued it. That is to explain the next statement, which says: "The flask was left in the bath until 4:00 A. M." That is to indicate that during that interval from 1:52 down to 4 A. M. the flask was left in the oil bath and the bubbling of the hydrogen had been discontinued.

X Q. 360. Was there nothing said at the conclusion or towards the conclusion of this experiment with the flask method about its not being successful and that it would be re-tried at the Mellen Institute?

A. I do not remember anything like that.

X Q. 361. You heard nothing of that kind?

A. Not that I remember, no. I remember that arrangements were made for another set of experiments at Mellen Institute.

627 X Q. 362. You do not know why?

A. For two reasons, as far as I know.

X Q. 363. Give the two reasons.

A. One to demonstrate further the Paal and Roth method and one was to demonstrate further this so-called bubbling method.

X Q. 364. If the bubbling had been successful at Berlin Mills why should they do the experiment over at Mellen Institute?

A. The same experiment was not repeated exactly. Different types of catalyser were used at the Mellen Institute.

X Q. 365. You say then, Mr. Richter, that there was nothing at all said at Berlin Mills to representatives of the plaintiff company about the test with this flask method and the experiment not being successful?

A. I do not say that nothing was said along those lines. I say I remember nothing at all regarding that.

X Q. 366. You do now say you remember nothing at all about that?

A. Yes, sir.

X Q. 367. So far as you know and so far as was expressed by the parties present the experiment with the Bedford apparatus was of the same kind of success as with the flask method?

A. It all depends on what you mean by success.

X Q. 368. I am asking you now what was said there or expressed by the parties present?

A. If any expression or statements was made by anyone there with authority or otherwise, I do not remember it.

X Q. 369. Your experiment now with this flask method was treated by the parties present, by what they said, in the same way as the experiment with the Bedford apparatus was treated?

A. I do not get your point. I do not understand what you mean by "in the same way." It was treated in a different way.

628 The object of that second experiment, as far as I knew from the counsel was to demonstrate principles they had in mind. These experiments were carried out absolutely under the direction of our counsel. The results of these experiments and the general conclusions to be drawn were to be drawn by counsel.

X Q. 370. Were they expressed by counsel there to you?

A. The interpretation of these results was not expressed to me, no.

X Q. 371. Not at all?

A. Not enough to voice an opinion upon it; no, sir.

X Q. 372. Your counsel at that time did not express in any way or intimate to you that the result of this flask experiment had been unsuccessful?

A. No, sir. I was notified to appear in Pittsburgh about two weeks after that, I believe, to witness under Dr. Bacon's direction another set of different experiments to demonstrate principles which they did not explain at the time for the counsel of the company.

X Q. 373. And it was not stated at Berlin Mills that this flask experiment would be re-tried at the Mellen Institute?

Mr. May: I object to that.

X Q. 374. Do you mean to say, Mr. Richter, that there was nothing said by your counsel in regard to this flask experiment at Berlin Mills not being successful?

A. Not that I know of.

X Q. 375. That it could be re-tried at the Mellen Institute?

A. I do not believe the statement was made that that experiment would be re-tried at Mellen Institute, because the experiments we did carry on at Mellen Institute were somewhat different.
629 They were different in a very material aspect in that the nickel was prepared in a different way and reduced in a different way, and the per cent. of nickel to oil was entirely different, and the hydrogen used up was entirely different, and the products obtained were entirely different, and used for different purposes. The experiments, in other words, along the lines of bubbling hydrogen through oil in the presence of the catalyser at Pittsburgh were entirely different as far as the factors of operation were concerned. The temperatures were different.

X Q. 376. Do you, Mr. Richter, know why the catalyst at the Berlin Mills experiment for the flask was made from reduced nickel oxide?

A. Yes.

X Q. 377. Why?

A. Because in our apparatus at the plant we used nickel oxide. It is convenient for us to have a batch of nickel oxide reduced at the plant by means of the hydrogen running through our ordinary pipe lines and heaters and what we did was to send this nickel oxide over to the plant and reduce the nickel oxide by means of the hydrogen in the plant, heated electrically by means of their electric heaters. That is the reason we used nickel oxide, being the simplest method of preparation of the catalyser that we knew of then.

X Q. 378. So far as you know this experiment of the flask had nothing to do with any carrying out of a process of some prior patent?

A. Officially no; but unofficially I assume that it did, yes.

X Q. 379. Just what do you mean by officially and unofficially?

A. That is, this experiment was carried out, as I said before, by

advice and direction of our counsel. The conditions were
630 stated and the methods were stated in detail. It did not take much reasoning on my part to assume that they were trying to demonstrate a so-called Normann experiment although I had received no official announcement.

X Q. 380. They were trying to demonstrate the Normann experiment at the Berlin Mills?

A. I think so.

X Q. 381. Then at Mellen Institute they were not trying to demonstrate the Normann experiment?

A. They may have been trying to demonstrate the same type of experiment; I do not know what they were trying there to demonstrate, and we can tell better when Dr. Bacon testifies, whether they were trying to demonstrate the fact that varying different conditions somewhat would not vary the general principles of the entire process.

X Q. 382. Were you not present at the Mellen Institute?

A. Yes.

X Q. 383. You know what took place there?

A. Yes; I do.

X Q. 384. And you took, did you not, about as much part in the experiment in the Mellen Institute as you did at Berlin Mills?

A. I was a mere laboratory assistant there.

X Q. 385. You did not then take as much part at the Mellen Institute as you did at Berlin Mills?

A. No; I did not.

X Q. 386. You had full charge at Berlin Mills?

A. Yes; full charge of the carrying out of this experiment under direction of our counsel.

X Q. 387. There was a very large quantity of hydrogen used in this last experiment, was there not?

A. Yes.

X Q. 388. There were three flasks?

A. The third one was started; I do not know how much
631 was used.

X Q. 389. How much hydrogen was contained in one of these flasks?

A. A full flask will contain about between 180 and 190 cubic feet, I believe.

X Q. 390. And what was the pressure of the hydrogen used in bubbling through?

A. What is the pressure in the flask?

X Q. 391. Yes; the pressure in the flask in bubbling through.

A. To start with?

X Q. 392. As it was used there hour after hour in carrying on this experiment; I am talking about the flask method.

A. Do you mean the pressure of the hydrogen flask or of the flask in which the oil was hydrogenated?

X Q. 393. I mean the pressure of the hydrogen in the flask in the oil when it was bubbling through.

A. There is no appreciable pressure in the flask.

X Q. 394. There was not any?

A. No.

X Q. 395. Behind the hydrogen; in pushing the hydrogen through, except of its own expansion, was the hydrogen under pressure when it was introduced in the flask?

A. The hydrogen in the cylinder was under pressure; yes.

X Q. 396. Under what pressure?

A. Starting about 1,500 pounds, I think.

X Q. 397. Is that 1,500 pounds' pressure let right into the flask?

A. No, sir; there is a reducing valve on the cylinder.

X Q. 398. That is what I wanted to get at; I wanted to know what the pressure was that drove the hydrogen into the flask.

A. Do you want to know, in other words, the pressure registered on the gauge next to the reducing valve?

X Q. 399. Yes; give me that.

A. The pressure next to the reducing valve was 13 pounds here to start with; 13 to 15 pounds, I guess, during the experiment—14 pounds.

632 X Q. 400. That was sufficient to throw the mass of material in the flask with the very violent agitation up into the outlet pipe of the hydrogen, was it not?

A. Yes.

X Q. 401. Now, in the flask, you had a flask about half full?

A. Yes; of oil; from half to two-thirds, I guess.

X Q. 402. And fully half of that was catalyst, was it not?

A. I would have to look up my notes on that again.

X Q. 403. I wanted to get out that it was about half and half a mixture of catalyst and oil.

A. Do you mean by catalyst the nickel weight with the oil?

X Q. 404. Yes; that is what I mean.

A. In that sense, yes, but of course that catalyser contained comparatively little nickel; that is, probably 20 per cent.

X Q. 405. The catalyser that you put in this flask contained comparatively little nickel?

A. That is, the slushy, slurry catalyser that we introduced into the flask with the clean cottonseed oil.

X Q. 406. Where was this catalyst when you took it out to put it in the flask; from what container did you take it out?

A. I believe it was in a pail, if I remember right.

X Q. 407. A big round can?

A. I cannot recollect; I could not say; that is the way they get lots of it.

X Q. 408. Was it not just in an almost dry condition?

A. I cannot testify to that without my notes.

X Q. 409. But you were telling me that you had very little catalyst in this flask?

A. I think so.

X Q. 410. I want to know whether the catalyst in the can was not almost dry?

A. I can tell you in a minute, Mr. Allen.

633 X Q. 411. But, Mr. Richter, you answer me one question without looking up your notes and the next question you want

to look at your notes. I would like to have you answer me both questions without your notes as best you can.

A. As far as I remember that is the case.

X Q. 412. That it was dry?

A. No; that it was slushy.

X Q. 413. What do you mean by that; real wet?

A. The mixture of oil and catalyser, a sort of a mush; I would not swear to that without my notes, but that is my recollection.

X Q. 414. But you did swear, did you not, Mr. Richter, that the material in the flask was very little nickel?

A. Yes; as far as I know; yes.

X Q. 415. You gave me to understand then that there was nine-tenths of it oil and one-tenth, or very much less, was nickel; is not that what you want us to understand?

A. No; I do not want you to understand that. I want you to understand that the catalyser put in did not consist entirely of nickel. In other words, it was a mixture merely of nickel and oil. Its proportion I do not know absolutely without my notes. As I remember it was slurry, mushy.

X Q. 416. Why was it, Mr. Richter, when you were questioned about the experiment at the Berlin Mills that you gave the experiment on the last day of the Kayser apparatus; that you gave that experiment as if it was the only one that had happened or the first thing that had been done. Why did you do that in your testimony?

A. I believe I was asked to give the run that we made in this horizontal type of apparatus. We made two runs in that type. I happened to pick this run that we called L first; there was no other intention; merely that we had to select one of the two. I was
634 asked directly to testify as to the experiment in this horizontal type.

X Q. 417. I know; you were asked and you said that they made up a catalyst?

A. Yes.

X Q. 418. And that it was put in this horizontal type of apparatus?

A. With the oil.

X Q. 419. And that you proceeded to hydrogenate and that then you got out these L samples; is not that what you said?

A. Yes.

X Q. 420. But that is not what happened; is it not a fact that when we started and did that we got the K samples first?

A. The K run was made first; yes. The K run was made in this apparatus before the L run was conducted.

X Q. 421. How was it that you did not tell us that when you were asked what experiments were done with this apparatus?

A. I was not asked to testify as to one particular run. I was asked to testify as to the run in the horizontal type of apparatus. I naturally used my own judgment in selecting one of those two.

X Q. 422. In this oil bath that was used in producing the N samples why did you take that temperature that was taken for the oil bath?

A. In making any experiments in a chemical laboratory, even though it may be a qualitative experiment, we generally record the temperatures employed, and the temperatures that happened to be there during the experiments we recorded; and, furthermore, I do not know absolutely, but I believe that counsel told us to do that.

X Q. 423. Told you to take that temperature?

A. I think so.

X Q. 424. Was the hydrogen that was used pure hydrogen?

A. It was hydrogen obtained from the ordinary steel
635 cylinders as we buy it on the market.

X Q. 425. And that is supposed to be pure hydrogen?

A. I do not know whether it contains a trace of oxygen or not.

X Q. 426. Do you know how that hydrogen is made?

A. Electrolytically, I believe.

X Q. 427. The electrolytic hydrogen that goes in these flasks commercially is supposed to be quite pure hydrogen, is it not?

A. Quite pure; yes.

Redirect examination.

By Mr. May:

R. D. Q. 428. During Mr. Gifford's cross examination you were asked as to the addition of stearin in a product produced by hydrogenation assuming a certain proportion of saturated fats in the original oil. Now suppose that you started with a cotton-seed oil having 23.3 per cent. saturated fats, how much would you have to increase the stearin in order to get the hydrogenated fat having 23 per cent?

A. You would have to subtract three-tenths of a per cent.

R. D. Q. 429. So that if you started with an oil which had 23 per cent., or 23.3 per cent. of saturated fats, and you desired to produce a hydrogenized product having a range of the stearin constituent from 20 to 25 per cent. even to secure the maximum saturated fat, how much would you have to add?

A. 1.7 per cent.

R. D. Q. 430. You were also asked as to running the same product around and around through the apparatus of the defendant in order to try to get a product having a low iodin value and you said that you had succeeded by that method experimentally in producing a product having an iodin value of 55; is that right?

A. Yes.

636 R. D. Q. 431. What was the melting point and the titer of that product?

A. The melting point was 53.2 Centigrade and the titer 45.25 Centigrade.

R. D. Q. 432. What practical considerations are there, Mr. Richter, which prevent your carrying the oil around and around through the catalyser bed in defendant's apparatus?

A. One is the decrease in capacity and another is the effect which we notice in doing this; namely, a plugging up of the catalyser; a plugging up of the diaphragm which means that much higher pres-

sures must be used if this operation were to be continued and this would handicap the process.

R. D. Q. 433. You mean that the viscosity of the oil increases?

A. The viscosity of the oil increases as your hydrogenation takes place and this appears in some way to plug up the diaphragm.

R. D. Q. 434. Is there any means in the hydrogenator or capsule for heating the catalyst directly?

A. No; the capsule is heated by means of coils of superheated steam around the capsule and all the heat that reaches the diaphragm must reach it by means of hot hydrogen or the hot oil.

R. D. Q. 435. And the catalyst itself is confined between layers of asbestos, I believe you said?

A. Asbestos.

R. D. Q. 436. So that, if I understand you correctly, when the oil gets hardened up to a certain point then it clogs the diaphragm and stops the apparatus?

A. Yes.

R. D. Q. 437. Commercially the defendant does not pass the oil through the hydrogenator more than once?

A. Never.

R. D. Q. 438. It would cut down the production?

A. It would cut down the production directly proportional to the number of times you pass it through.

637 R. D. Q. 439. You were asked about the Normann run in the experiments at the Berlin Mills research laboratory in November at which counsel was present. You said that a large amount of hydrogen was used. That hydrogen was permitted to escape into the atmosphere?

A. Yes; it escaped into the atmosphere.

R. D. Q. 440. If you had circulated that hydrogen around through the glass flask would you have used so much?

A. No; we would have used only a very, very small percentage of that hydrogen.

R. D. Q. 441. I notice, Mr. Richter, that of the harder samples that were produced by you in response to the request of plaintiff's counsel which represent samples of the N run, or run carried on by bubbling hydrogen through the glass flash, that the harder products appear to be brown colored. Do you know what this is due to?

A. I think I do. As I said before, the catalyser was prepared at the "Kream Krisp" plant by means of the hydrogen which was used at the "Kream Krisp" plant for reducing the catalyser in the capsules. This hydrogen passes through a pipe line which may contain entrapped oil, burnt oil, due to the circulating of the hydrogen back and forth through the capsule. It is very probable that during this reduction the hydrogen carried with it some particles of this burnt oil and that the catalyser which we used in this experiment probably contained material quantities of this burnt oil, thus coloring the product.

R. D. Q. 442. And that would affect the color of the product?

A. Yes.

R. D. Q. 443. What effect, if you know, would that have upon the activity of the catalyst?

A. The presence of burnt oil influences the activity in that it lessens it; the activity is somewhat destroyed, and as the burnt
638 oil accumulates, if it does accumulate, in any process the activity of the catalyser diminishes. In other words, it has a partial poisoning effect.

Recross-examination.

By Mr. Gifford:

R. X Q. 444. If the hydrogenizing operation in the N run at Berlin had been conducted until the oil was saturated what would have been the melting point, about?

A. Somewheres up near 60 degrees Centigrade.

By Mr. Allen:

Q. 445. And in these flask experiments, about what per cent. of hydrogen would you have used if you had circulated the hydrogen; what proportion?

A. Based on the weight of the oil you would have used about one-tenth of one per cent.

FRANK E. BARROWS, a witness called in behalf of the defendant, being duly sworn, testified as follows:

Direct examination.

By Mr. Pennie:

Q. 1. What is your name?

A. Frank E. Burrows.

Q. 2. What is your age?

A. 28.

Q. 3. Your residence?

A. Brooklyn.

Q. 4. Are you an attorney at law?

A. I am.

Q. 5. Are you connected in any way with the defendant's counsel in your practice as an attorney at law?

A. Yes; I have been associated with counsel for the defendant ever since the suit was pending.

639 Q. 6. That is with the firm of which I am a member?

A. Yes.

Q. 7. Have you also been associated with me and with Mr. May, of counsel for the defendant, in drawing up the plan of defense in this case?

A. I have.

Q. 8. Are you also a chemist?

A. My college course was in chemical engineering; in the Patent Office I was in the Chemical Division.

Q. 9. The Kayser patents that have been referred to in evidence in this case are the subject matter of a suit brought against the American Cotton Oil Company and against Swift & Company; is that true?

A. That is true.

Q. 10. Were you present at a hearing on a motion before Judge Rellstab in the United States District Court for the District of New Jersey, the purpose of that motion being to ascertain from the plaintiff the date of the Kayser invention?

A. I was.

Q. 11. At that time was the present suit likewise pending?

A. It was.

Q. 12. Was any statement made by counsel for the plaintiff in this present cause as to the whereabouts of Kayser at that time?

A. There was.

Q. 13. What was stated in that behalf in open court before Judge Rellstab?

A. In opposing our motion for a bill of particulars it was given as one reason that the particulars of Kayser's invention should not be given, that the fact was that Kayser was no longer associated with the plaintiff in that case or subject to its control; that he was as accessible to us, the defendants in that case, as to them, the plaintiffs, and if we wanted this information which we asked for in our bill of particulars, we should get it ourselves from Mr. Kayser and not compel them to get it for us because it would be a hardship for them to do so.

640 Q. *13.* Was it stated where Keyser was at any time in this hearing?

A. It is my recollection that it was stated at that time that Kayser was somewhere in the eastern part of the United States; probably in Massachusetts or Pennsylvania.

Q. 14. Do you know after that hearing what effort was made to locate Kayser in the United States?

A. I know that we made many inquiries attempting to locate him in various places where we thought he might be and for a month or more we were unsuccessful in finding out anything about his whereabouts.

Q. 15. Did we finally ascertain where he was?

A. We did.

Q. 16. Where was he?

A. We found that his residence was probably in the Isle of Jersey and through cable instructions to our associates in England we found that while his residence was still there that he was interned as a prisoner of war as a German.

Q. 17. Did you go to Engalnd for the purpose of interviewing him?

A. I did.

Q. 18. Concerning this present suit?

A. Concerning this suit and the other suits which you have referred to.

Q. 19. What success did you have in that direction?

A. It took about two months before I finally got to see him.

Q. 20. Why was that?

A. I would like very much to know. When I got to England, I think it was the 29th of May, the application was made for an interview with him. He was at an internment camp, not far from London, and the permit was granted for the following Friday; I think it was about June 2nd. I went out to the internment camp at Alexandria Palace, was stopped at the gate; my permit was taken
641 away and I was refused admission without any reason being assigned. I called up the Commanding Officer of the internment camp and was refused any information. I then made further inquiries and was finally informed that it would be necessary to take the matter up with the War Department. At the War Department I was even refused an interview.

Finally, after taking the matter up with the American Embassy they made informal inquiries and learned that an express order had been entered by the War Department to the effect that I personally was not permitted to see Mr. Kayser.

Mr. Gifford: If your Honor please, that is purely hearsay.

The Court: What has this got to do with the case; are you showing your efforts to get Kayser?

Mr. Pennie: I am showing my efforts to get Kayser, that I have been obliged to go into the enemy's camp to find out about this prior use.

The Witness: I may say that at the suggestion of the Ambassador that he could do nothing further to help us, we cabled over and had the matter taken up with the State Department at his suggestion, and only after it had been taken up by the State Department and made a matter of official instructions to him, only then was I able to get an interview with Mr. Kayser.

Q. 21. You finally were, after the difficulties you have spoken of, admitted to interview with Kayser?

A. And a representative of the British War Department was also present.

642 Q. 22. What occurred at that interview, briefly?

A. It is almost easier to tell what did not occur, because Mr. Kayser was almost violent in his refusal to discuss the matter in anyway.

Q. 23. What matter?

A. The first thing he asked me was who I was and who I represented. I told him I represented the opponents of Procter & Gamble in America and he got up and started to leave. He said if that is the case he would have nothing to say, and I told him I would like to tell him what I came to see him about; that I thought it would interest him, and he indicated that it did not, but he would listen to me provided I did not ask him any questions, and inadvertently I did ask him if he knew of the Burchenal patent and again he got up and started to leave, and when I told him I thought he would be interested he said, "If Mr. Burchenal had wanted me to know about them he would have told me." But after two or three further questions along that line he got up and left, or started

to leave, and then he began to speak of other things, trying to be pleasant apparently, and said he would like to take me around the internment camp if he could. He seemed to be cordial toward anyone from America but he would not talk hydrogenation.

Q. 24. He declined to talk then about the Burchenal patent?

A. In any way.

Q. 25. Or about his connection with the Procter & Gamble Company?

A. He would not talk about hydrogenation in any way and he said so.

Q. 26. Please state whether you endeavored to get knowledge of his work in the United States by inquiry of the firm of Crosfield & Company for whom he worked while he was in England?

643 A. I made inquiries at Crosfield's; first from Major Crosfield, whom I called up over the telephone from Liverpool. He said he was just home wounded from the hospital and that he was not in a condition to grant an interview.

Q. 27. Briefly, did you succeed in getting any information from Crosfield & Company as to Kayser's activities in the United States?

A. Almost nothing; they would not even tell me whether they were in any way connected with Procter & Gamble; they refused to discuss the matter in any way.

Q. 28. The upshot then of your trip to England to obtain knowledge of Kayser's activities in the United States, either from Kayser or from the firm with which he was associated there, was entirely negligible; is that true?

A. That is true.

Cross-examination.

By Mr. Kerr:

X Q. 29. You recall that I represented the plaintiff in opposing the motion before Judge Rellstab?

A. Yes.

X Q. 30. Do you recall that I stated that I did not know where Mr. Kayser was?

A. I think you stated that and then stated that it was your understanding that he was somewhere in the eastern part of the United States. I think I said that I understood from what was said there that he was somewhere in the eastern part of the United States.

X Q. 31. But I said nothing about Pennsylvania or Massachusetts which I understood you to say in the first part of your testimony?

A. It may be that Mr. Bryne said that. Come to think of it I think it was. I think that was at the time we were coming back from the hearing on our motion here in this suit.

644 Mr. Pennie: In response to your Honor's inquiry made at an earlier session as to the date when notice was received in the present case by the defendant company of the alleged infringement, I have some originals and copies of the correspondence that took place. I offer these letters in evidence, subject to correction.

Adjourned to Tuesday, March 27th, 1917, at 11:00 A. M.

NEW YORK, March 27, 1917—10:30 A. M.

Trial Resumed.

Mr. Pennie: If your Honor please, I offered at the end of yesterday's session a series of letters and copies of letters embodying correspondence between the plaintiff and the defendant or its responsible officers. I have submitted this to counsel for the plaintiff over night, and I now offer it in evidence.

Marked Defendant's Exhibit V-1.

RAYMOND F. BACON, a witness called on behalf of the defendant, being duly sworn, testified as follows:

Direct examination.

By Mr. Pennie:

Q 1. What is your name?
A. Raymond F. Bacon.
Q. 2. Your residence?
A. Pittsburgh, Pennsylvania.
Q. 3. Your age?
A. Thirty-six.
Q. 4. What is your occupation?
645 A. I am a chemist. I am Dean of the School of Chemistry of the University of Pittsburg and Director of the Mellon Institute of Industrial Research.
Q. 5. Is this the same Mellon Institute that has been referred to by some of the witnesses that have already been examined in this cause during this hearing?
A. Yes, sir.
Q. 6. Please state briefly what the Mellon Institute is.
A. The Mellon Institute is an endowed institution for the purpose of investigating industrial problems for corporations or for anyone that cares to have these industrial problems investigated. The general plan is that a corporation may pay the salary of the men in the Mellon Institute and the Mellon Institute does the investigation through those men.
Q. 7. Please state whether one of the questions that has been investigated at the Mellon Institute has been the manufacture of leavened bread in its various phases?
A. It has; yes, sir.
Q. 8. Please state the nature and character of that particular investigation?
A. We have had three men working on bread as bread chemists for some six years, and they have made literally thousands of experiments and hundreds of tests, both in the Mellon Institute and in various bakeries on methods of bread manufacture, the general idea being to improve the methods of bread manufacture.
Q. 9. Has this work been under your personal supervision?

A. It has.

Q. 10. And have you been acquainted with and kept in touch with it during its entire progress?

A. I have.

Q. 11. What is the name of the founder of the particular Fellowship dealing with the manufacture of bread?

A. The Ward Baking Company.

646 Q. 12. Is that a large concern?

A. Probably the largest baking concern in the United States, or in the world.

Q. 13. In the course of these five or six years of the activity of the Ward Baking Company's Fellowship at the Mellen Institute, to which you have referred, have you had occasion among other things to become well acquainted with the action of fatty materials when employed as shortening agents?

A. I have.

Q. 14. Do you know whether refined cottonseed oil is used as a shortening agent?

A. It is used as a shortening agent in immense quantities in the manufacture of bread; yes, sir.

Q. 15. Are you likewise acquainted with the manufacture of crackers?

A. Yes, sir.

Q. 16. Is it used likewise in that art?

A. To a certain extent; yes, sir.

Q. 17. In what bakeries to your personal knowledge has refined cottonseed oil in a liquid condition been used as the sole shortening agent in the manufacture of leavened bread?

A. I have personal knowledge of its use as the sole shortening agent in several of the bakeries of the Ward Baking Company. I think, so far as my personal knowledge goes I would say in the Bronx Bakery of the Ward Baking Company of New York, in the Pittsburg Bakery of the Ward Baking Company, in the Cleveland Bakery of the Ward Baking Company, and in the Chicago Bakery of the Ward Baking Company.

Q. 18. Have you personal knowledge of the manner in which liquid cottonseed oil is thus used by the Ward Baking Company as a shortening and as the sole shortening in the manufacture of leavened bread?

A. I have.

Q. 19. How is that done, when they use liquid cottonseed
647 oil for that purpose—that is, in the way that I have referred to in my last question?

A. The liquid cottonseed oil is weighed out together with the other materials which go into a dough batch and all of those materials are placed in a large mechanical mixer and are mixed together. The mixed dough then passes on to later stages of the operation, such as the fermentation, and so forth.

Q. 20. Have you seen likewise at your bread making equipment in the Mellon Institute the use of liquid cottonseed oil as a shortening agent?

A. Yes, sir.

Q. 21. Specify some of the materials in which you have seen it used in the manufacture of shortened products at the Mellen Institute?

A. I have seen it used in the manufacture of bread, in the manufacture of biscuits, in making pie crust and in making cake.

Q. 22. When properly used is there any difficulty arising from the employment of liquid cottonseed oil as a shortening material for any of these purposes; that is to say, either for the manufacture of leavened bread, of biscuits, pie crust or cake?

A. No, it may be used as an efficient shortening agent for any of these purposes.

Q. 23. Do you know whether oleostearin or other fat of like degree of hardness can be used as a shortening agent in the manufacture of bread?

A. Yes, sir; it can.

Q. 24. Is that likewise true of fats harder than oleostearin even?

A. Yes, sir.

Q. 25. How do you know this?

A. We have made many breads with oleostearin and with much harder fats than oleostearin. We have made, I suppose, hundreds of loaves of bread in the laboratory in that way, and afterwards made batches in the bakery; and I know that at the present time such hard material is used in the bakery in a commercial way.

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Q. 26. Is there any disadvantage in the use of the hardened fat such as oleostearin or one of even greater hardness in the manufacture of leavened bread, as compared with the use of liquid cottonseed oil for the same shortening purpose?

A. No, on the contrary, there are a number of advantages in using these harder products.

Q. 27. Please state some of those advantages.

A. The primary advantage is from the standpoint of general cleanliness in the bakery. Whenever there is a liquid fat used there is always a danger that it may slop out of the vessels in which it is measured and may make the bakery have an unclean appearance, but the greatest advantage is on the score of economy. Very much less of a hard fat will give the same shortening effect as a greater quantity of a liquid fat, and this shortening effect is really proportional to the melting point of the fat.

Q. 28. That is to say, as I understand it, insofar as shortening is concerned there is a marked superiority from the standpoint of economy in the use of hard fats of the melting point of oleostearin and higher in the manufacture of leavened bread and similar products?

A. That is true.

Q. 29. Is the use of hard fat advantageously for the purposes to which you have referred restricted to oleostearin or does it likewise apply to other hard fats?

A. We have used various types of oleostearin and various types of palmitin and various types of hydrogenated fats, and we believe that any hard fat will serve the purpose.

Q. 30. Please state what hard fat is used at the present time in the Bronx plant and other plants of the Ward Baking Company as the shortening agent in the manufacture of leavened bread?

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A. It is hardened vegetable oil, I think, at the present time cottonseed oil. Cottonseed oil of a melting point of approximately 55 or 56.

Q. 31. Have you a specimen of that fat with you?

A. I have.

Mr. Pennie: The specimen produced by the witness is offered in evidence.

Marked Defendant's Exhibit W-1.

Q. 32. Do you know whether this hardened cotton-seed oil of the product that you have just produced is used at the present time exclusively by the Ward Baking Company in the manufacture of its leavened bread at its Bronx plant?

A. Yes, sir; it is.

Q. 33. Is it so used?

A. Yes, sir.

Q. 34. How is that hard fat incorporated in the dough batch?

A. This hard fat is first melted and is mixed with heated flour and this fatted flour is then ground and the mixture of hard fat and flour is added to the other materials of the dough batch just as they go into the mixing machine.

Q. 35. Do you know approximately the average daily output in loaves of bread of the Ward Baking Company in this City?

A. The average for all the plants of the Ward Baking Company is something over a million loaves a day. For the City of New York, that is for Greater New York, I would say between three hundred and four hundred thousand a day.

Q. 36. You have spoken of the economy of using hard fat instead of liquid cottonseed oil. Does this apply to the manufacture of leavened bread, for instance?

650

A. Yes, sir. That is one of the cases which I spoke of.

Q. 37. What is that economy expressed in, in general terms?

A. A great deal less than half of the amount of fat is sufficient for shortening.

Q. 38. Is this true of the product that has just been introduced in evidence, hydrogenized cotton-seed oil of that degree of hardness?

A. Yes, sir.

Q. 39. Is there anything inferior or detrimental to use in liquid cottonseed oil when used as a shortening agent?

A. I would say no. When you say detrimental to use you mean detrimental in what sense?

Q. 40. I have unfortunately quoted the expression that is used in plaintiff's patent. I mean in the sense in which one might understand that word or phrase as addressed to the ordinary intelligence.

A. As I understand the question I would answer no.

Q. 41. Can it readily be incorporated into pie crust?

A. It can be readily incorporated into pie crust. In order to make

a very good pie crust special means must be used, just the same as special means must be employed in the use of any fat in making a thoroughly satisfactory pie crust.

Q. 42. How is the shortening of pie crust effected?

A. It is effected by fats of different kinds, sometimes lard, sometimes lard compound, or various fats of that general character.

Q. 43. How is the shortening agent, whatever it may be, either lard or lard compound or liquid cottonseed oil, incorporated into the dough from which the pie crust is baked?

A. The fat is mixed with the flour and in order to obtain a good pie crust the skilful cook will be very careful about the way in which he makes that mixture, because if the mixture is properly
651 made a good pie crust will result, if it is improperly made a soggy pie crust is apt to result.

Q. 44. When properly incorporated in the batch from which either bread, cake, biscuit or pie crust is made, is there any difficulty in the use of liquid cottonseed oil?

A. No, sir.

Q. 45. When it is properly incorporated, does it tend to separate out in the bottom of the batch as a soggy layer?

A. It does not.

Q. 46. Do you know whether oleostearin and hydrogenized cottonseed oil hardened to the same or higher melting point than oleostearin are used indifferently, the one for the other, in any other typical food products than those which you have specifically referred to?

A. They have been used to a certain extent in the manufacture of margerine. I do not know that that use has been wide at all. In fact, I do not think it has.

Q. 47. Do you know whether it is used in the confectioner's art?

A. Yes; I know that such products are sometimes used in the confectioner's art in place of cocoa butter.

Q. 48. What is the consistency or the stiffness of cocoa butter at ordinary temperatures?

A. It is a solid at ordinary temperatures.

Q. 49. Are you acquainted to some extent with the state of the art relating to the hydrogenation of fats and oils of a date prior to November 10th, 1910, the date of the filing of the application of the patent here in suit?

A. Yes.

Q. 50. During the examination of Mr. Richardson he referred to the widespread manufacture and use of so-called lard compounds; that is to say, compounds made from 80 to 90 per cent. of liquid cottonseed oil, together with a stiffening agent such as oleostearin.
652 Will you please refer to an early instance in the prior state of the art in which this manufacture is described?

A. I refer to patent to Joseph Sears No. 10,783 of 1887.

Q. 51. Is this an American patent?

A. A British patent.

Q. 52. What is set forth generally in that patent?

A. I think that the general statement of the patent may be given by reading the first few lines.

"This invention relates to a compound intended for use in cooking, as a substitute for lard or plain cottonseed oil, and it consists in a non-fluid compound of refined but unbleached cottonseed oil and an animal or vegetable fat adapted to impart to the mixture a desired degree of stiffness."

Q. 53. What is the particular stiffening ingredient that is referred to thereafter in the specification of the British patent to Sears to which you have referred?

A. A stearin or beef suet.

Q. 54. Are there various vegetable fats that are of sufficient hardness to serve as a stiffening agent for cottonseed oil in the manufacture of this product referred to in the Sears patent?

A. Yes.

Q. 55. What would be the effect of adding any of those hard, vegetable oils to the liquid cottonseed oil?

A. If sufficient was added it would give a semi-solid product.

Q. 56. Will you please read into the record the brief claim of this patent?

A. "As an article of manufacture the herein described compound composed of refined unbleached cottonseed oil and a fat adapted to give a stiffness to the compound corresponding substantially to that of refined lard."

653 Mr. Pennie: I offer the Sears patent in evidence.

Mr. Gifford: As far as I know we never heard of or saw this Sears patent in connection with this suit.

Mr. Pennie: I offer it as part of the prior state of the art; not as anticipatory of the supposed invention of the Letters patent in suit.

Marked Defendant's Exhibit X-1.

Q. 57. Reference has been made during the taking of the depositions here in this cause to the contribution made by Dr. Wilhelm Normann to the hydrogenation of oils and fats. Are you acquainted with the patents which issued to him in Germany and in Great Britain upon this subject?

A. I am.

Q. 58. Will you please state what was the character of his contribution to the state of the art as indicated in his German patent No. 141,029 and in his British patent No. 1,515 of 1903,

A. These patents are for a process of converting unsaturated fatty acids or their glycerids into saturated compounds.

Dr. Normann discovered, and sets forth in the patent, that unsaturated acids or unsaturated oils by the action of hydrogen in the presence of finely divided nickel may be converted into corresponding saturated compounds. He defines the reaction rather carefully in some regards. He says, for instance, if fine nickel powder obtained by reduction in a current of hydrogen is added to chemically pure oleic acid, then the latter heated over an oil bath and a strong current of hydrogen is caused to pass through it for a sufficient
654 length of time, the oleic acid may be completely converted into stearic acid.

Further on he says:

"Apart from the formation of small quantities of nickel soap, which may be easily decomposed by dilute mineral acids, the reaction passes off without any secondary reaction taking place."

I think that those two sentences which I have read very well define the product which is obtained by such reduction especially the second sentence, where he says that the reaction goes on in a quantitative way, we will say; that is he says that there is no side reaction takes place. A chemist would know from this first paragraph where he says that oleic acid goes to stearic acid, and from the second one where he says that no side reaction takes place, the chemist would know exactly what the product is which is formed by this reaction.

Dr. Normann then goes on to give some examples of the carrying out of this process. He gives an example with acids, fatty acids of tallow, and oleic acid, and so forth. He then gives an example with a glycerid. I will quote just what he says:

"The same method is applicable not only to free fatty acids, but also to their glycerids occurring in nature, that is to say, to fats and oils. Olive oil will yield a hard, tallow-like mass; linseed oil and fish oil will give similar results."

"By the new method, all kinds of unsaturated fatty acids and their glycerids may be easily hydrogenized."

655 I would call attention particularly to the fact that he hardened olive oil to a hard, tallow-like mass. Tallow is a substance that is obtained from the fat of either cattle or of sheep and is a substance of somewhat semi-solid character; that is, its lower limit of melting point is within a lard range and its upper limit is just slightly beyond the lard range so that if Normann hardened olive oil to a tallow-like mass that means that he hardened it to a product of a semi-solid character.

Q. 59. Are you sufficiently familiar with the hydrogenation of olive oil to know what occurs in that hydrogenation from the initial stage in which the olive oil is in a liquid condition up to the stage at which it obtains a tallow like consistency?

A. Yes; I am.

Q. 60. What occurs in that hydrogenation from stage to stage?

A. Physically one notes that the liquid olive oil becomes first more viscous and gradually semi-solid, and finally the solid in the final product is exceedingly hard. It is a progressive reaction, passes through all these various stages that I have enumerated.

Q. 61. What happens to the unsaturated glycerids during these successive or progressive stages?

A. The unsaturated glycerids are gradually saturated by the hydrogen.

Q. 62. And the saturated glycerids; does anything happen to them?

A. They are not changed, no.

Q. 63. Does Normann specify anywhere in his patent any of the purposes for which his patents are intended?

A. He does not. He says nothing in the patent as to what these products should be used for. The presumption is that they might be used for any purpose for which fats of that general character
656 could be utilized. They might be used for making candles; they might be used for soaps; they might be used for edible purposes.

By the passages I have read he has very carefully specified what the product is so that any chemist would know for what particular purposes it might be useful.

Q. 64. In the process of hydrogenation as described in the Normann patent from which you made citations; that is, the British patent No. 1515 of 1903, what would your conclusion be as to the edibility of the resultant product when the material hydrogenated was among those suggested by him, olive oil?

A. If an edible olive oil was started with one would certainly obtain an edible hydrogenated product.

Q. 65. Does his patent give one skilled in the art to fully understand that that would be the case?

A. I think it does by defining the nature of the product, yes, sir. It does not say in so many words anything about edibility, but by defining the nature of the product it certainly would.

Q. 66. What is the passage that would lead one versed in the art to know that starting with edible olive oil he would have as the final result an edible hydrogenated olive oil of tallow like consistency?

A. The passage in particular is:

"The reaction passes off without any secondary reaction."

Q. 67. This is the passage that you referred to in one of your earlier answers?

A. Yes, sir. I might also say that in considering that last passage one should also consider what he says above in the paragraph that I noted before regarding the change of chemically pure oleic acid into stearic acid.

657 Q. 68. Have you yourself practiced the process described in the British Normann patent No. 1,515 of 1903 and its corresponding German patent?

A. Yes.

Q. 69. Upon what fats or oils?

A. At different times upon a very large number of fats and oils.

Q. 70. Have these operations included animal and vegetable oils?

A. Yes, sir.

Q. 71. Have you practiced the process described in the Normann patents referred to in the hydrogenation of refined cotton-seed oil?

A. Yes, sir.

Q. 72. And have you likewise practiced it in the hydrogenation of crude cotton-seed oil?

A. Yes, sir.

Q. 73. It appears from the testimony of Mr. Richter, one of the

witnesses examined during the taking of this testimony, that at the laboratory of the Berlin Mills Company, the defendant herein, refined cotton-seed oil was hydrogenated in the so-called Kayser apparatus and likewise in the flask. Were you present at those hydrogenations?

A. Yes, sir.

Q. 74. And did you subsequently thereto at the Mellen Institute in the presence of counsel and experts for the plaintiff in this case carry on the hydrogenation of refined cotton-seed oil?

A. Yes, sir.

Q. 75. In the hydrogenations that were effected at the laboratory of the Mellen Institute on the occasion referred to in my last answer what different types of hydrogenation were carried on?

A. Two different types were carried on. In one type, which we will call the Normann type, the hydrogenation was carried out in a flask, oil catalyser being in this flask and the flask heated by an external oil bath. The hydrogen was bubbled through the flask
658 and the hydrogenation thus made.

The other type of hydrogenation carried out was according to the directions of the Paal and Roth article in the Berichter.

Q. 76. Referring now to the first type of hydrogenation which was carried out at the laboratory of the Mellen Institute in the presence of counsel and the experts for the plaintiff, will you please state more fully just what was done beginning with whatever catalyser was employed in the operation?

A. There were two occasions in which such experiments were made. The first occasion was, as I remember it, on December 3rd, 1916, and on that occasion experiments of the type that you have spoken of were failures so that I will not say anything about that at the present time.

On the second occasion, on December 10th, we prepared the catalyser according to the directions given by Sabatier and Senderens for the preparation of a nickel catalyser for this purpose. The catalyser was then placed under oil, protected from oxydation and a considerable amount of this catalyser was added to refined cotton-seed oil in each of four flasks and hydrogen was passed through the heated mixture of oil and catalyst, and from time to time samples were taken out.

Q. 77. Were samples of the products produced at that time and to which you have last referred handed to counsel for the plaintiff?

A. Yes.

Q. 78. Will you please produce the samples obtained by you and identify them individually?

A. Four flasks used in this experiment were given a letter so that the material removed from each flask was numbered with that letter
659 and also with a sub-number. Those letters were O, P, Q and R for the four flasks, respectively, and I have here certain of the samples. The samples which I have are samples O-1, O-2 O-3 and O-4; samples P-1, P-2 and P-3; samples Q-1, Q-2 and samples R-1, R-2, R-3 and R-4.

Q. 79. What is the starting material from which these various samples were produced?

A. Refined cottonseed oil.

Q. 80. And what is the significance of the numbers of 1, 2 and 3, with which these several samples are marked?

A. The progressive numbers represent samples taken out at various intervals during the hydrogenation and correspound to the progressive addition of hydrogen to cotton-seed oil.

Mr. Pennie: The samples produced by the witness are enclosed in a box and offered in evidence.

Marked Defendant's Exhibit Y-1.

Q. 81. What do these larger samples represent which I now hand you and which were in the same box?

A. These are additional samples of the same product, these particular ones being P-3, O-4 and R-4.

Q. 82. I note that on the smaller samples, the labels contain certain writings. What does this writing signify?

A. This writing is to identify the samples with the experiment. It gives the type of apparatus used, the fact that cotton-seed oil was the starting material, the temperature used and the pressure.

Q. 83. What was the temperature employed?

A. 180 to 190 degrees centigrade.

Q. 84. And what was the pressure?

A. Atmospheric pressure.

660 Q. On the larger samples, P-3, O-4 and R-4 appear other indications in writing; what do these mean?

A. You will find on these samples statements of the melting point and the iodin number.

Q. 86. What is the melting point and the iodin number of these three larger samples, respectively?

A. For sample P-3, melting point, 54.9 degrees centigrade and iodin number 27.4.

For sample O-4, melting point 50.4 degrees centigrade; iodin number 38.3.

For sample R-4, melting point 57.7 degrees centigrade; iodin number 17.1.

Mr. Pennie: I offer these last three samples in evidence.

Sample O-4 marked Defendant's Exhibit Z-1.

Sample P-3 marked Defendant's Exhibit A-2.

Sample R-4 marked Defendant's Exhibit B-2.

Q. 87. Was any difficulty of any sort encountered in the hydrogenation of these samples produced on December 10th, 1916, at the Mellen Institute to which you have testified?

A. No.

Q. 88. Did you use any of that material thus hydrogenated at the Mellen Institute to which you have last referred as a shortening agent?

Mr. Gifford: I object, if your Honor please, to putting in testimony as to experiments as to the use of this thing at which we were not present and notified to be present.

Mr. Pennie: As to that, if your Honor please, the use does not concern the manufacture of the product. It is really its
661 availability and it would certainly have been extreme for us to ask our friends to remain there while we were engaged in the cooking operation and baking operation.

Objection overruled; exception.

A. We did.

Q. 89. Is this one of the products (indicating)?

A. Yes, sir.

Q. 90. What is this product?

A. It is a cake.

Mr. Pennie: The product produced by the witness is offered in evidence.

Marked Defendant's Exhibit C-2.

Q. 91. This hydrogenation of cotton-seed oil made by you at the Mellen Institute on December 10th, in the manner that you have specifically described was intended to embody what process?

A. The Normann process.

Q. 92. Of what patent?

A. British patent No. 1,515 of 1903, and the corresponding German patent.

Q. 93. Referring again to the specimen of that hydrogenation, which I will refer to as the Normann hydrogenation, is there any critical point at which the hydrogenation begins or accelerates, from its earlier stage to its final stage of ultimate hardness?

A. No, sir.

Recess.

Q. 94. Referring further to the hydrogenation of refined cotton-seed oil, by what I have called the Normann process—that is to say, by the bubbling of hydrogen through refined cotton-seed oil
662 in the presence of a reduced nickel catalyser, will you please state whether you have actually seen that operation in use on a commercial scale in the United States?

A. I have seen this operation in use on a commercial scale in three places.

Q. 95. Please state where and what the particular use was seen with respect to the details of the process and apparatus?

A. I have seen this operation at the Guttenberg plant of the American Cotton Oil Company. At this plant a large tank was used, a large vertical tank holding approximately 8,000 pounds. That was the amount of cotton-seed oil of refined cotton-seed oil which was used in this particular run that I am about to describe. At the bottom of this tank was a manifold consisting of a pipe about one inch in diameter and with a very large number of small openings. The tank was closed and at the top of the tank was an outlet pipe which was connected with a suction pump. Hydrogen was sucked through this pump through the oil in this tank and the oil contained a cata-

lyst of reduced nickel. The oil was progressively hardened and was finally made very hard.

I have also seen this operation at the plant of the Larkin Company in Buffalo. At this plant the tank used held about 1600 pounds of oil. There was a pipe manifold at the bottom of the tank and an outlet at the top, and hydrogen was circulated through the oil around and around until the oil became hardened. The catalyser used was reduced nickel and the oil that was used was a refined cotton-seed oil.

I have also seen an operation of this kind at the plant of the American Oil Products Company in Cincinnati. In that plant there was a distributing pipe near the bottom of the tank used and an
663 outlet pipe toward the top. The catalyser was a reduced nickel catalyser, and the oil that was being hardened at the time I saw this run was soya bean oil.

Q. 96. When was this?

A. When I saw these various things? At the American Cotton Oil plant the run I was describing was about the 1st of July, 1916, or probably the latter part of June. At the Larkin plant I saw it some time early in July, 1916, and at the American Oil Products plant in Cincinnati, I would say about the last of September of 1916.

Q. 97. What is soya bean oil?

A. Soya bean oil is a vegetable oil that is a very common oil on the market.

Q. 98. And about how hard were the products of these several operations, in the several plants that you have referred to?

A. The final product in every case was quite hard. In some of these operations samples were taken from — to time. In fact, in all of them samples were taken from time to time and the product was examined to see whether it was fully hardened, but in all cases they were making quite hard products.

Q. 99. One of the hydrogenations that you have referred to as having been carried on at the laboratory of the Mellen Institute on December 10th, 1916, in the presence of counsel and experts for the plaintiff has been designated as the Paal and Roth hydrogenation. Will you please state what that Paal and Roth process was and where a description of it occurs in prior literature of the art—that is to say, in the literature prior to November 10th, 1910, the date of the filing of the application upon which the patent in suit was granted?

A. A description of this Paal and Roth process and pro-
664 ducts obtained by it occurs in the Berichte der deutschen chemischen Gesellschaft, Volume 41, pages 2282 to 2291 of 1908 and in the same journal Volume 42, pages 1541 to 1553 of 1909. In the experiments described by Paal and Roth nickel is not used as a catalyser, but another catalyser is used, which is colloidal palladium. There are several metals which have the same catalytic effect and the one Paal and Roth used was colloidal and palladium.

Q. 100. What is colloidal palladium?

A. Palladium is an element, it is a metal. Colloidal palladium is the element divided exceedingly finely until it reaches what we call the colloidal state of subdivision. That is an exceedingly fine state of subdivision.

Q. 101. Please proceed with a description of what Paal and Roth set forth in the articles that you have referred to, giving attention first to their article of the year 1908.

A. This article tells about a number of hydrogenation reactions on oleic acid and on certain oils which Paal and Roth had carried out with the aid of colloidal palladium, and I will read only certain points which might have interest in connection with the present case. They start out under the head "The Reduction of Fats." "The animal and vegetable fats and oils are, as is well known, mixtures of the glycerine esters of saturated and unsaturated fatty acids; some of them contain in addition the glycerine esters of unsaturated oxy-fatty acids. The ratio in which the glycerine esters are present in the separate fats is only relatively constant, it varies within certain limits. All fats, without exception, contain glycerids of unsaturated acids in the presence of glycerids of the saturated acids."

665 Q. 102. Where are you reading from?

A. I am reading from the bottom of page 4 of our translation, the first article, Volume 41.

"The amount of glycerid of unsaturated acids is determined on the basis of the quantity of iodin or chlorine which they will take up. The Hubl Iodin Number which gives the quantity of iodin in per cent. of the amount of fat under certain definite conditions and which in food chemistry plays an important part in detecting adulteration and in the identification of the fats is within certain limits constant for each individual fat."

Then skipping, I will read again on page 6 of the translation, about the middle of the page:

"The above described transformation of oleic acid into stearic acid led us to expand our experiments to include the fats also. We chose as our starting material at first two vegetable fats, castor oil and olive oil, and an animal fat, cod liver oil, which have high iodin numbers and are therefore rich in unsaturated fatty acids. * * * By measuring the quantity of hydrogen absorbed and by determining the iodin number of the reduced fats by the process usually employed in food chemistry we could follow the progress of the hydrogenation and determine the end of the process."

I will call attention to the fact that all through this article, in every experiment—and the same applies to the later article—Paal and Roth give tables in which they specify the time in minutes
666 and the amount of hydrogen absorbed, showing that they understood very well that was a progressive reaction, and I would like to call attention to certain cases showing that they obtained incompletely hydrogenated fats.

On page 11 of the translation I will read the quotation where he is speaking about the hydrogenation of olive oil, and in speaking of hydrogenated fat he says:

"The iodin number of the hydrogenated fat was 9. This shows that the original oil had been hydrogenated to a considerable degree, but that complete hydrogenation had not taken place by any means."

In the second article, reference to which has already been given, I would like to read just a few extracts. On page 1 of the translation, near the bottom of the page:

"Besides castor oil and olive oil which were studied in our first communication, we have experimented with the vegetable fats, croton oil, sesame oil, cotton-seed oil, linseed oil, as well as animal fats, as represented by butter, lard and oleomargarine. With these fats also it was rare that we could at once accomplish a complete hydrogenation down to an iodin number of zero. But when the partially hydrogenated fats were subjected to another reduction, it was possible in most cases to accomplish complete hydrogenation."

On the second page, near the top:

"In our last communication we stated that reduced cod liver oil with its iodin number 3 no longer showed the characteristic
667 color reactions of this oil which depend on the presence of lipochromes. Similar observations were made with sesame and with cotton-seed oil. The former, after being hydrogenated only gave a faint Baudouin test and the latter gave negative results with the Beechi and Halphen tests. Similarly the very poisonous croton oil was converted by hydrogenation into a perfectly non-poisonous tallow.

In contrast to the natural fats which on standing naturally become rancid more or less rapidly, the hydrogenated fats show an extraordinary stability after being kept for six months or a year in loosely stoppered bottles, they remained entirely unchanged and had no rancid odor or taste."

I will call attention on page 7 of the translation and on the following page to the fact that after studying the physiological action of croton oil which had been hydrogenated, it took a specially prepared completely hydrogenated reduced croton oil and particularly hydrogenated croton oil, and these were used in physiological experiments.

On page 9 of the translation at the top of the page speaking of the hydrogenation of olive oil for the complete hydrogenation which was accomplished in two stages, two grams of the original oil, iodin number 81, was reduced in the manner already described and thus a tallow like product was obtained with an iodin number 39.7 in quantitative yield. Of this product 1.8 grams was taken for further hydrogenation.

At the top of page 11 of the translation:

668 "Since the above hydrogenation of the sesame oil was by no means complete 1.5 grams of the product were again emulsified," and so forth.

At the top of page 12 in describing the hydrogenation of cotton-seed oil in the experiment he says:

"As the fat was again hydrogenated to a considerable degree, the fat globules began to solidify out of the emulsion and, for that reason, no further addition of hydrogen took place."

He then describes how to hydrogenate it further, he warmed the product up.

At the bottom of page 12:

"Cottonseed oil gives the Beechi and Halphen tests which are used in food chemistry for detecting the presence of this oil when used as an adulterant."

He then describes the methods of making these two tests which I will not read into the record and then goes on to say:

"Both of the hydrogenated products which we obtained from cottonseed oil failed to give either of the above tests. This shows that the unsaponifiable constituents, as well as the unsaturated fatty acids, are acted upon by the catalytic reduction and in this case the effect was permanent for negative tests were obtained even after the products had stood for ten months."

669 I would also call attention to that fact that Paal and Roth hydrogenated butter, and that at first they hydrogenated it only part way and incompletely. At page 15 this says:

"In spite of the fact that more than the theoretical quantity of hydrogen had been absorbed, the glycerides of unsaturated acids were not completely hydrogenized, for the iodine number of the fat, which melted at 39.5-41 degrees was 13.6."

He then describes how to rehydrogenate it to obtain it completely hydrogenated.

I also call attention to the fact that he hydrogenated oleomargarine as given on page 17 of the translation.

Q. 103. Summarizing these Paal and Roth disclosures from which you have quoted, will you please state what they set forth?

A. They set forth very clearly that Paal and Roth hydrogenated a large number of oils. In several cases they hydrogenated them incompletely, and I think that so far as any indication is given at all, that one might assume that they were thinking of the use of this substance for food purposes, although they do not say *it* any place that they propose any uses for these products. But they speak of using the methods used on food products in examining them; in fact they give no uses for them for any purpose, of course. They state in practically every case that the product was white and that it was tasteless.

Q. 104. Do they make any reference to the circumstance that hydrogenated oils are less subject to rancidity than the original oils that were hydrogenated?

A. Yes; I read such an excerpt into the record.

670 Q. 105. And with special reference to cotton-seed oil do they note that hydrogenated cotton-seed oil does not respond to the Halphen reaction?

A. That is stated several times in this article.

Q. 106. Will you now proceed to narrate the hydrogenation that

was carried on at the Mellen Institute on December 10th, 1916, to which you have made general reference before?

A. These hydrogenations were made in accordance with the directions given by Paal and Roth and on December 10th, 1916, we hydrogenated cotton-seed oil. On that particular date everything was done in the way stated by Paal and Roth except that the quantities were very much increased over the quantities described in the experiments of Paal and Roth, but everything was kept constant so far as ratios were concerned, and two samples were taken; one sample was marked T-1 and one was marked T-2.

I would like to state also that on December 3rd in the presence of counsel for the plaintiff and their experts a similar experiment was made and samples were taken which were marked S-1 and S-2.

Q. 107. I may have misled you in giving the date December 10th, 1916. Will you please examine your notes and see whether tests were made on both days of Paal and Roth?

A. Tests were made December 3rd, 1916, and December 10th, 1916, about both of which I have already testified. Tests were also made on November 27th, 1916.

Q. 108. Were these latter tests likewise in the presence of counsel and experts for the plaintiff?

A. Yes, they were; they were made at Berlin Mills and the sample obtained in that run was marked P and R-1.

Q. 109. Will you please produce the sample that was made by the Paal and Roth method at the Berlin Mills Company laboratory on November 27th, 1916.

671

A. I now produce the sample.

Mr. Pennie: I offer it in evidence.

Marked Defendant's Exhibit D-2.

Q. 110. Will you please produce the samples that were made in accordance with the Paal and Roth method as testified by you at the laboratory at the Mellen Institute on December 3rd, 1916?

A. I now produce the samples.

Mr. Pennie: I offer them in evidence.

Marked Defendant's Exhibits E-2 and F-2.

Q. 111. Will you produce the samples made by the Paal and Roth method as described by you at the Mellen Institute laboratory on December 10th, 1916?

A. I now produce those samples.

Mr. Pennie: I offer them in evidence.

Marked Defendant's Exhibits G-2 and H-2.

Q. 112. All of these samples comprising the three different hydrogenations in accordance with the Paal and Roth method were conducted, as I understand you, in the presence of counsel and experts for the plaintiff?

A. Yes, sir.

Q. 113. Were counsel for the plaintiff likewise supplied with por-

tions of the same product which is contained in these sample exhibits?

A. I think they were; I am quite sure that samples were offered to them.

Mr. Pennie: That is so, is it not, Mr. Allen?

Mr. Allen: Yes.

672 Q. 114. Referring to these several hydrogenations in accordance with the Paal and Roth method, did you note that the hydrogenation was progressing from the beginning to the end of the several runs?

A. Yes, it was.

Q. 115. Was there any critical point at which there was any sudden rise in the hydrogenation, or other sudden change?

A. In actually running these Paal and Roth experiments we start them at ordinary temperature, and if the temperature is not raised the reaction will stop at a point where the oil solidifies at any ordinary temperature. If the temperature is raised then the reaction is started and proceeds up to final completion.

Q. 116. And is that explained by Paal and Roth in the articles which you have referred to?

A. Yes; they speak of that point. But outside of the question that if you start at an ordinary temperature and only allow the reaction to proceed as far as it would go at ordinary temperature, you might say that there was—I understood you to say a critical point of acceleration—there is a point there where the reaction stops. But if you were speaking about the reaction taking place at a temperature that does not allow the fat to solidify in the reacting vessel then there is no critical point or point of acceleration.

Q. 117. That is to say, as I understand it, as long as the temperature is maintained to a degree sufficient to keep the product liquid, the hydrogenation proceeds progressively?

A. Yes, sir.

Q. 118. And without acceleration?

A. Yes, sir; that is correct.

Q. 119. Do you likewise find disclosed in the prior literature of the art the hydrogenation of fats and oils progressively so that
673 the description shows that it may be terminated short of the production of a hard product?

A. Yes; I do.

I would call attention particularly to an article by Fokin in the Journal of the Russian Chemical Society, Volume 38, pages 855 to 858 of 1906, where this statement is made:

"The reduction of glycerids proceeds with more difficulty than that of the free acids nevertheless it is not difficult to convert linseed oil or any other drying oil whatever into substances with small iodin numbers, at first into products of the type of sunflower oil or poppy oil, and then into products analogus to sesame oil or cottonseed oil. Almond and olive oil undergo a metamorphosis into fats corresponding to beef or mutton drippings."

I would wish particularly to call attention to the fact that beef

or mutton drippings is what is known as beef tallow or mutton tallow; that is, the rendered fat of beef or mutton and is very close to the lard range in melting point and is actually used by many people for cooking and shortening purposes.

In the first paragraph spoken of when he says that to convert linseed oil into an oil of the type of sunflower oil or poppy oil and then into products analogous to sesame or cotton-seed oil, he speaks about a progressive reduction of iodin number; that is, the iodin number of linseed oil is, say, approximately 185, the iodin number of sunflower is approximately 120; the iodin number of cottonseed oil, say, approximately 110. So he is speaking about a progressive hydrogenation but still a hydrogenation very far short of completion.

674 I would also call attention to an article by Fokin in the Journal of the Russian Physical Chemical Society, Volume 40, pages 304 to 321 of 1908. In this article the reduction of the number of vegetable oils is given and the progressive hydrogenation is followed by means of plotting curves which show the progressive hydrogenation of the oils.

Q. 120. Referring to the original Fokin article which is also on record will you please state upon what page of that article appears the curve mentioned on pages 5 and 15 of the translation?

A. On pages 307 and 313 of the original article.

Q. 121. In referring to these Fokin articles you have spoken of the reduction of the oils hydrogenated by him; what did you intend by the word "reduction"; what does it mean in oil chemistry?

A. The addition of hydrogen is a reduction.

Q. 122. So that reduction means in the sense in which you used the term the same as hydrogenation?

A. It is the same as hydrogenation; yes.

Q. 123. And that is the way that chemists frequently refer to hydrogenation?

A. Yes.

Q. 124. What did Fokin use as the catalyst in effecting the hydrogenation of the oils to which he refers in this series of articles?

A. He uses in most cases reduced nickel.

Q. 125. Did he use likewise other catalysts?

A. Yes; I believe he did.

Q. 126. In the file wrapper and contents of the Letters patent in suit reference is made to a German patent to Erdmann, No. 211,669, published July 13th, 1909. Will you please describe what relation that patent has to the hydrogenation of fats and oils?

The Court: Does not that patent speak for itself; is there any use in going through all these patents that you will have to argue
675 about with this man?

(Question withdrawn.)

Q. 127. The final paragraph of the specification of the Erdmann patent is as follows:

"In example II, the oleic acid was replaced by low melting tallow of the solidification point 31 degrees. The product was a harder tallow of the solidification point of 38 degrees."

Will you please state what tallow is as to the composition of its constituent parts and what was effected by this rise of the solidification point from 31 degrees to 38 degrees?

A. Tallow is composed of glycerids, linolin, olein and stearin using the terms in the sense in which we use them in this case, and by hydrogenation it is thus converted into a product containing more stearin, but still very far short of complete hydrogenation.

Q. 128. Referring to the Paal & Roth disclosure, the Fokin disclosure and the disclosure contained in the Erdmann German patent, is there anything in the processes therein set forth which would result when starting from an initial edible oil into a non-edible product at any stage of the hydrogenation?

A. No; there is not. In fact, in any process of hydrogenation with which I am familiar the hydrogenation does not change the edibility of the oil except in very rare cases where it may change a non-edible oil over into an edible oil like in the case of croton oil, but you start with any edible oil and subject it to hydrogenation the product is always edible.

676 The Court: Are they making the claim that your product is not edible?

Mr. Pennie: I think part of the claim is that they have ascertained that a hydrogenated product is an edible product whereas one should assume according to their argument, as I fancy it will be ultimately made, that it would be anticipated that the hydrogenated product whether partly hydrogenated or wholly hydrogenated would in some mysterious way be made inedible. That is the reason that I have asked the witness to go into that point.

The Court: Are you claiming, Mr. Gifford, that their product is not edible, or that hydrogenated cottonseed oil at any period is not edible at any stage?

Mr. Gifford: From our present day knowledge with the knowledge of the Burchenal invention, it is edible at every stage, but that was not known at the time of the art prior to Burchenal's invention.

The Court: So they need not answer that argument because you are not making it?

Mr. Gifford: We are not making the argument as to what is known today because it is now known that it is edible all along the line, but it was Burchenal's discovery that it would be edible.

The Court: They are not putting in this evidence to show what anybody thought; they are putting it in to show a fact that it is edible during all stages of progress and you do not deny that?

Mr. Gifford: No.

677 Mr. Pennie: The significance of the last question that I asked the witness and his answer thereto is that if one starts with an edible product, as is proposed in the Normann process, in the Paahl & Roth process, in the Fokin process and in the

Erdmann process, that necessarily an edible product will be produced as the result of that hydrogenation.

The Court: They say so too; they say that people did not know that before the date of their invention.

Mr. Gifford: And that the hard product was so hard that it would repel the idea of edibility by reason of its hardness.

Mr. Pennie: Then I understand that the edibility of the product produced in accordance with these prior art processes when you start with an edible oil as the initial material, is conceded regardless of the stage of the hydrogenation attained; that is my understanding.

Mr. Gifford: That is not exactly correct. The point is that these products of the prior art were so hard that in the condition in which they were produced they were not edible. They were edible in the sense that in the art subsequent to Burchenal's invention they can be prepared or treated in such a way that they become part of an edible product.

The Court: Or they would be edible if they were melted up?

Mr. Gifford: Yes; they would not poison anyone.

The Court: They would answer that purpose in cooking if they were melted up; it might be unattractive or inconvenient;
678 that is another thing. Of course, they would not be edible in their present form any more than a chunk of lard would be to the ordinary person for any length of time.

Mr. Gifford: I am not prepared to say that they could be melted up and used in that way in the place of lard; I rather think that is not so. But as this witness has testified it has been discovered later on that by melting them up and mixing them with flour in a certain way, a self-shortening flour can be produced. That is the result of the experiment, as I understand it, at the Mellen Institute.

Q. 129. The edibility of hard fat and its feasibility for use as a shortening material is not limited to a period later than the date of the patent here in suit, is it?

A. No, sir; it was known prior to the date of the application for the patent in suit that hard fats could be used for shortening material.

Q. 130. Will you please produce a patent containing that information?

A. I now produce United States patent No. 884,606, dated April 14th, 1908, to Robert H. McFarland which describes the use of a hard fat for shortening purposes.

Mr. Pennie: I offer it in evidence.

Marked Defendant's Exhibit I-2.

Cross-examination.

By Mr. Gifford:

X Q. 131. You have stated, I believe, that cottonseed oil hydrogenated so as to be hard like Defendant's Exhibit W-1 is used in baking bread?

A. Yes.

X Q. 132. Will you please describe just how it is used?

679 A. The hard oil is melted and mixed with flour, with heated flour. This is allowed to cool and is ground up and that mixture of hard oil and heated flour is added to the other constituents of the dough batch and the whole mixture is made into bread in the usual way.

X Q. 133. What are the usual constituents of the dough batch?

A. Flour, yeast, water, salt and sugar.

X Q. 134. After the hard oil like Exhibit W-1 is added to the heated flour in melted condition and then the two are allowed to cool, does it become hard again like Exhibit W-1?

A. The mixture of flour and fat is not hard; no.

X Q. 135. Why do you grind it up?

A. We want it in a fine state of subdivision, of course.

X Q. 136. What kind of a machine do you grind it with?

A. I think it is a disc grinder if I remember correctly.

X Q. 137. Do you know when that process of using the hard oil like Defendant's Exhibit W-1 was arrived at?

A. That was put into commercial operation in the bakeries about a year ago.

X Q. 138. And was it invented by the aid or through the instrumentality of the Mellen Institute?

A. The particular process used was, yes.

X Q. 139. Was it the subject of application for patent, if you know?

A. The process of incorporating the fat was; yes.

X Q. 140. And was the fat incorporated with the flour also made the subject of an application for patent?

A. It was not; no, sir.

X Q. 141. Simply the process?

A. Simply the process; yes.

X Q. 142. So that until a year ago, about, that method of using hard oils like Defendant's Exhibit W-1 was not known?

680 A. This patent that I speak about describes the process of making bread; it does not describe the use of hard oil for any purpose. It describes a particular method of making bread and this particular method of making bread was not known until the time of the application for this patent but the use of hard oils was known; yes.

By the Court:

Q. 143. What did that particular method essentially consist of, as you understand it?

A. There was a very pronounced saving of fat that could be used. The two conditions that made it patentable from our viewpoint were the very pronounced saving of the fat and the fact that the bread baked with this hard fat did not grow stale so easily. We did not claim in the patent any use for hard fat per se; in fact, we bought some other patents that were prior to that time which dealt with the

use of the hard fat per se; we did not claim any such use in this patent. We simply claimed a specific method for making bread.

By Mr. Gifford:

X Q. 144. What were those other patents that you bought?

A. We bought the Estabrook patents.

X Q. 145. Do you know what the particular numbers and dates were?

A. I do not; no; they were about 1913 or 1914; I do not know the exact date.

X Q. 146. And, as you understand it, were they for inventions to enable the use of hard fats like Exhibit W-1 as an edible product?

A. They were for inventions on a self-shortening flour, so-called; that is, a mixture of flour and fat for shortening purposes
681 and the fat employed was a hard fat. I do not believe those are the first instances of the use of a hard fat.

By the Court:

Q. 147. You believe that using a hard fat saves expenses?

A. It did in the making of leavened bread; yes; that is, when we started these investigations we were sure we could use hard fat but we did not know whether there would be any advantage in it, and the real idea had to do with slovenliness around the bakery and when we got into it we discovered much to our surprise that we could use very much less and we thought that that was a thing that could not have been foreseen and we applied for patents on that.

By Mr. Gifford:

X Q. 148. And these Estabrook patents were along the same line?

A. No; these Estabrook patents simply described a self-shortening flour made from hard fat and flour mixed together.

X Q. 149. Ground up?

A. Well; yes, but not melted; simply the hard fat ground up and mixed with flour. Now, such a mixture will not give the effect that we get by the use of this product that I am speaking of; this melting flour and fat product.

X Q. 150. Now, with the exception of this Estabrok patented process and the subsequent patented process of the patent applied for by the Mellen Institute, was there any previous use as an edible product of a hardened fat like Exhibit W-1 by simply using it in connection with the flour without the previous addition of any substance to the fat?

A. When you say a hardened fat do you mean a hydro-
682 genated fat or do you mean any hard fat?

X Q. 151. I mean a hydrogenated fat?

A. I do not know of any previous commercial use in the manner you ask about.

X Q. 152. You do know, however, of the previous commercial use of the hard hydrogenated fat mixed with cotton seed oil to make a lard substitute?

A. Yes, sir.

X Q. 153. Did you know that that originated with the Proctor & Gamble Company?

A. I have seen a patent of the Proctor & Gamble Company.

X Q. 154. You mean the Burchenal patent, I suppose?

A. Yes.

X Q. 155. In the Mellen Institute process of utilizing a hard fat like Defendant's Exhibit W-1 for edible purposes, when the baker or bakery melts this hard fat for the purpose of combining it with the heated flour, what purpose does he have for doing so?

A. The bakery does not melt the hard fat at all; it is simply sent out to them in the form mixed with flour and that material is simply added to the dough batch.

X Q. 156. Who prepares it?

A. The Ward Baking Company prepares this material.

X Q. 157. And they have apparatus for doing so?

A. Yes.

X Q. 158. What is that apparatus?

A. Do I understand you to mean prepare hardened fat?

X Q. 159. No; I mean apparatus for taking the hardened fat and melting it and combining it with the flour?

A. That apparatus consists essentially of a steam jacketed kettle in which the hard fat is melted and the flour is previously heated in a pan-shaped vessel and is then introduced into the steam jacketed kettle and is stirred into the steam jacketed kettle by means of stirring arms. This material is then allowed to cool and is
683 taken out and ground, and put into sacks.

X Q. 160. Is that apparatus the subject of an application for patent?

A. It is not; no.

X Q. 161. Who got it up?

A. I would say that it was gotten up by consultation between myself and some of the men in the Ward Baking Company.

X Q. 162. Does the Ward Baking Company sell this to bakers?

A. This material?

X Q. 163. This mixed material?

A. Yes; they do.

X Q. 164. So that, after it is sold it is in these sacks and the flour is already mixed with the hardened oil which has been mixed as you have stated?

A. Yes.

X Q. 165. Do you know what the product is called?

A. It is called "floraline."

X Q. 166. And that product, you say, is not the subject of an application for any patent?

A. No, sir; it is not.

X Q. 167. And that product, you say, appeared on the market only within a year or so?

A. Yes, sir.

X Q. 168. And it is that product which you say can be used to greater advantage than a liquid shortening for shortening?

A. Yes.

X Q. 169. You have also stated that the Ward Company uses cottonseed oil, what apparatus do they employ for mixing the cottonseed oil with the dough batch?

A. It is the regular type of dough mixer.

X Q. 170. Do you know what it is known as commercially?

A. I think it is known as the Corby Mixer.

X Q. 171. Will you describe that in general terms?

A. It is essentially a box in which is a rapidly revolving shaft carrying arms that mix the various constituents of the dough and mix them into a dough.

684 X Q. 172. Is that a large and powerful apparatus?

A. The type usually used by them is about eight feet long and three feet high and three feet wide, I should say.

X Q. 173. Do you know how much power it requires to run it?

A. No; but I should say that it requires quite a little power. Dough is a very stiff material, of course; I should say considerable power, I do not know the exact amount.

X Q. 174. Do you know whether any patents exist on that apparatus?

A. I think there are patents on the Corby Mixer.

X Q. 175. And it is by means of that apparatus that the oil is properly incorporated, as you have stated, with the dough?

A. Yes; however, if you mean to imply that this is not a usual type of apparatus, that it is an unusual type of apparatus, I would wish to make a statement that this is a usual type of apparatus used by all bakeries.

X Q. 176. But not for household purposes, I suppose?

A. No; not for household purposes.

X Q. 177. All of your statements as to the utility of the cottonseed oil for baking and its proper incorporation with the dough for that purpose have referred to factory use and not to household use, I suppose?

A. No; that is incorrect and in fact, in the last answer that I gave I was thinking only of the commercial side of the thing. That is the reason I made the answer, but I know positively that this hard fat can be used in the ordinary way of baking in the household because we have used it in the laboratory with the ordinary utensils used by the home cook and have obtained the same result that is obtained in the bakery and many of my answers given with regard to the use of cottonseed oil or of hard fat also apply to household baking.

685. X Q. 178. But this hard fat unless it is prepared in some such way with the flour, as you have described by the Mellen process, you do not know of its being used in the household, do you?

A. I know that it can be used in the household. I do not know that it is. The facts are these: You can use hard fats in the ordinary way in which fat is used in making bread and you will get a shortening effect, but you will not get this very great saving in the shortening effect unless you mix it with the flour in the way we have proposed. That is, the amount of oil used in shortening bread, let us say, on a cetrain bread, three per cent. If you are using hard fat

and do not mix it in some special way it will take pretty near three per cent., but if you mix it in some special way, with the flour at first, then you can cut down the amount required to very much less than half of that.

X Q. 179. How would you say that the household cook should go to work to use the hard fat?

A. She could use the hard fat if she would grind it up fine and simply mix it in with the flour.

X Q. 180. Grind it up fine and mix it with the flour?

A. Yes, sir.

X Q. 181. So that she would have to put it through this grinding treatment before she could mix it with the flour?

A. She certainly could not mix a chunk with the flour.

X Q. 182. And as I understood you, the household cook not having the means that the factory has to properly incorporate the cotton-seed oil with the dough, would have more or less difficulty in getting good results?

A. No, I did not say that. I said that cotton-seed oil could be used in home cooking without any special appliances.

X Q. 183. But you have heard what Professor Walker testi-
686 fied to as to the difficulties that the cook might have, have you not?

A. I remember he said something about it, but I do not remember exactly what he said.

X Q. 184. Do you remember anything that he said that you disagree with?

A. I remember that I did not agree with some of his statements. I do not remember specifically what they were. I remember at the time he made some statements that I did not agree with.

X Q. 185. You have also spoken of the use by the Ward Company of oleo-stearin for baking purposes. What do you mean by oleo-stearin?

A. Oleo-stearin is the pressed out fat from beef tallow. The hard part of beef tallow.

X Q. 186. And how is that used by the Ward Company for baking?

A. I did not say that it was used by the Ward Company for baking.

X Q. 187. I thought you said bread was made with oleo-stearin?

A. I know I said that, but I did not say by the Ward Company.

X Q. 188. How long do you mean that it is made?

A. I think the question that was asked me had to do with the use of fats like oleo-stearin or hard fats of that character, and whether or not they had been used in the manufacture of bread, and I said yes, they had. ow, actually, oleo-stearin itself has been used in the making of bread. We have made many hundreds of loaves of bread with oleo-stearin in the Mellen Institute, but it has not been used so far as I know on a commercial scale by anyone.

X Q. 189. How did you use it in the Mellen Institute?

A. Very much the same way that we used the hardened fat.

X Q. 190. Like Exhibit W–1?

A. Yes. We also made many experiments in which we
687 used it in exactly the same way that it is used in the household, simply mix it in with the flour, and you do not get any advantage in saving, or no pronounced advantage, unless you first melt it up with the flour. In that case you get a pronounced advantage in saving. We have made many tests in which we simply used it the same as we used lard or cottonseed oil or "Crisco" or any of those things.

X Q. 191. By the household use of oleo-stearin you mean its use by grinding it up and mixing it with the flour and then using that mixture in the dough?

A. No, I mean grinding it up and simply adding it to the other ingredients of the dough batch, just as you would add lard to the other ingredients of the dough batch.

X Q. 192. But lard you do not have to grind up before you use, do you?

A. Yes, I would say you do. It is not as hard to grind it up if you happen to get it communicated throughout the mass just as you do this.

X Q. 193. What means would the household cook use to grind up the oleo-stearin?

A. The presumption is if the household used oleo-stearin they would buy it ground up. They might use a meat chopper. A meat chopper would be suitable for the purpose in most kitchens, I think.

X Q. 194. You do not mean to say they have to use a meat chopper for grinding up lard?

A. Oh, no.

X Q. 195. As a matter of fact, do you know of oleo-stearin being used at all for household purposes?

A. No, not straight oleo-stearin. No, I do not.

X Q. 196. Why is it not?

A. I think the best way to put it is, why should it be? The fats that are used are the fats that happen to be cheap and hap-
688 pen to suit people's taste. For instance, in South America they choose to use beef tallow for all cooking purposes; in this country we choose to use lard, and in Italy they choose to use olive oil. It is just simply the customs that have grown up among different peoples.? It has to do a good deal with the particular oils that happen to be available in the different countries.

By the Court:

X Q. 197. Do they not use lard for such purposes in Italy?

A. I think practically all the cooking is by olive oil. Undoubtedly some lard is used, but the great proportion of cooking is done with olive oil, which is also used for shortening purposes.

X Q. 198. In its crude condition?

A. In the liquid condition, yes. It is refined olive oil. It is good olive oil.

By Mr. Gifford:

X Q. 199. You have stated, as I understand you, that when the hardened fat is used according to the Mellen process there is an economy of about one-half; is that so?

A. I said more than one-half, yes, sir.

X Q. 200. Why is that?

A. I do not know. I have not any idea. We have studied a great deal over this whole question as to why a certain amount of shortening will do certain work, and it does not fit in very well with any scientific theories. So we do not know.

X Q. 201. When did you discover it?

A. When did I discover what?

X Q. 202. That there was this economy?

A. According to this process that you are speaking about, I suppose you mean.

689 X Q. 203. Yes, according to the process I spoke about.

A. That was discovered some two years ago, I should say.

X Q. 204. And prior to that time what was supposed to be the relationship between the hard and the soft fats as shortening?

A. I do not know whether I know. The relationship in what respect?

X Q. 205. The relationship for shortening?

A. As to their efficiency, I suppose you mean?

X Q. 206. Yes, I mean as to their efficiency?

A. I do not think I have seen any statement on that subject. In fact, I would have supposed that one fat was about as good a shortening agent as another, and I do not believe that there is any exact work on that subject any place.

X Q. 207. You would suppose that a liquid fat would be about as good as a hard fat?

A. Yes, sir.

X Q. 208. That is, for shortening?

A. Yes, sir, and that the hard fat would be about as good as the liquid fat, also.

X Q. 209. You stated that there is nothing detrimental in the use of cotton-seed oil for shortening and you hesitated about the meaning of the word "detrimental," what did you have in mind?

A. I had in mind the question of convenience. I was thinking about the fact that I just spoke of a minute ago, that in this country we are trained to use lard; that has been one of the common fats here. Now, over in Italy they are trained to use liquid fats and in India, for instance, they use liquid fats almost altogether. So I suppose if you were to introduce a fat of the consistency of lard over there, particularly in India, it would be inconvenient to them, they are not trained that way. So I was thinking of that phase of

690 it, and that is the reason I hesitated.

X Q. 210. In that aspect, from the standpoint of this country, the use of cotton-seed oil would be detrimental?

A. Well, I suppose that you mean detrimental in the sense of in-

convenient or something of that kind. I would say that our cooks are better trained to use lard than they are to use cotton-seed oil.

X Q. 211. And the recipes that are published and have been published for a long time call for lard generally, do they not?

A. I think a great many of them do.

X Q. 212. You referred to the Sears British patent No. 10,783 of 1887. This is for a compound of cotton-seed oil and a fat adapted to give a stiffness to the compound corresponding substantially to that of refined lard. What do you understand to be the fat which is referred to?

A. It speaks of oleo-stearin as the preferred fat. It also says that any hard animal or vegetable fat may be used, I believe as the stiffening agent.

X Q. 213. What hard vegetable fat was known at that time, in 1887, as you understand it?

A. I suppose a great number were known. I could not say. Without looking back I would say sheaved butter and probably Chinese vegetable tallow and fats of that character. I could not say exactly when such fats came on the market without looking it up.

X Q. 214. Those vegetable oils that you have referred to, are they in their natural state, hard, or do they have to have their hard constituents separated by squeezing or some other process from the liquid constituents?

A. They are hard in their natural state as I understand it.

X Q. 215. You have quoted from the Normann English patent, the statement:

691 "Apart from the formation of small quantities of nickel soap which may be easily decomposed by dilute mineral acids, the reaction passes off without any secondary reaction taking place."

Is this statement applied to the case where "fine nickel powder obtained by a reduction in a current of hydrogen is added to chemically pure oleic acid"?

A. Do I understand your question to mean whether this statement applies to only the preceding wording, or do you mean does it apply to such a process?

X Q. 216. I mean that the statement is made in context with what I have quoted?

A. I did not so read the patent. I read this patent that that statement applies to the process. What it says is:

"The quantity of the nickel thus added and the temperature are immaterial and will only effect the duration of the process."

Then he goes ahead with this statement:

"Apart from the formation of small quantities of nickel soap," and so forth.

X Q. 217. The reaction which is stated just preceding what you

have quoted is the reaction between the hydrogen and the chemically pure oleic acid in the presence of refined nickel powder, is it?

A. Yes, and he gives that simply as an example. He says: "for instance," and in the original German patent it says:

"If one adds, for example."

So that is simply an example of the process. So that this statement, as I read the patent, applies to the process. Just above
692 that he has given an example in which he uses oleic acid and he very clearly says that it is an example. And then he goes on and he says:

"these certain things will effect duration of the process."

Then he goes ahead and says:

"Apart from the formation of small quantites of nickel soap," and so forth.

X Q. 218. If the statement that the reaction passes off without any secondary reaction taking place is to be understood as referring to the reaction with pure oleic acid, would it necessarily follow from that statement that there would be no secondary reaction if a complex body would be taken instead of pure oleic acid?

A. Please define your complex body a little more carefully.

X Q. 219. I do not think it is necessary to define that. I ask would it necessarily follow that because a single chemically pure body were referred to in that statement that a complex body would necessarily produce no secondary reaction?

A. In the form in which you have asked the question I cannot answer it, because I do not know even whether you mean a complex body of the nature of an oil. You asked me about a complex body. That does not mean anything to me.

X Q. 220. You know, do you not, that the statement that no secondary reactions would take place, when made with respect to a chemically pure single body, does not necessarily hold good if there be substituted a complex body?

A. I cannot answer that question. I do not understand what you mean.

693 X Q. 221. I do not think it is necessary to pursue that subject any further because it must be obvious. When olive oil is saturated by hydrogenization, do you know what melting point it has?

A. Approximately 69, or around there.

X Q. 222. And what iodin value?

A. Zero.

X Q. 223. You notice, do you not, that the claim of this Normann patent start out:

"The process for converting unsaturated fatty acids or their glycerids into saturated compounds"?

A. I do.

The Court: Was that Normann patent for an edible substance?

Mr. Gifford: It does not say anything about it one way or the other.

The Court: It does not say what its commercial use was intended to be?

Mr. Gifford: No, sir.

X Q. 224. The process described in this Normann patent, do you understand it to have been an underlying process and that the subsequent processes of hydrogenization were gotten up as variations of it?

A. I think that that is a reasonably fair statement of my understanding; yes, sir.

X Q. 225. And the various publications that you have referred to in your direct testimony relate to such variations of the Normann process intended to produce the same result?

A. No.

X Q. 226. In what respect do they vary?

A. Normann was the first man who ascertained that fats could be hydrogenated by nickel in a liquid condition. Some of the
694 publications which I cited had to do with the hydrogenation of fats by means of other catalysers than nicked. So that, where other catalysers were used, at least, I certainly would think that that had nothing to do whatever with the Normann process.

By the Court:

X Q. 227. They had nickel, did they?

A. Normann used nickel, yes, sir. Some of these other men used other catalysers.

By Mr. Gifford:

X Q. 228. Was not Normann a pioneer in the sense that he was the first one to apply that catalytic action to the mixture of hydrogen and liquid oil?

A. Yes, he was.

X Q. 229. So that these subsequent processes that you have referred to were also the application of the catalytic reaction to hydrogen and liquid oil?

A. Yes, but not with nickel. I would qualify the first answer by saying with nickel, because I believe that some other catalyser might have been used. I do not think that such a person would infringe Normann at all.

X Q. 230. But in the sense that it was the application of the catalytic reaction to the hydrogen and liquid oil, emphasizing liquid, it was an underlying reaction?

A. There have been cases before of catalytic reactions with liquids; but I think, if I understand your question correctly, yes.

X Q. 231. You have referred to the statement of Paal and Roth as follows:

695 "By the complete hydrogenation of the croton oil the physiological effects characteristic of this oil disappear entirely."

What is this due to, as you understand it?

A. That is probably due to the hydrogenation of croton oleic acid. At least the article itself says so.

X Q. 232. Is this one of the major constituents of croton oil or a minor constituent?

A. That is a constituent present in quite large quantities in croton oil, yes. At least, I think so. I would not be sure about it, but I think so.

X Q. 233. Is it known why the hydrogenation action on that constituent should destroy the physiological effect of the oil entirely?

A. No, I do not think so.

X Q. 234. But you understand, do you not, that this change in physiological effects is a change from a poisonous substance to a non-poisonous substance?

A. Yes, sir.

X Q. 235. In which of the prior art publications or patents that you have referred to is cotton-seed oil referred to?

A. In the Paal and Roth publication of 1909, volume 42, pages 1541 to 1553.

X Q. 236. Is that the only place that you remember at the present moment?

A. Cotton-seed oil is mentioned in the Fokin article that I quoted.

X Q. 237. At what point in the Fokin article?

A. It is mentioned in that particular quotation that I read for the record.

X Q. 238. In the publications and patents that you have cited on your direct testimony, as I understand you then, the only place that cotton-seed oil is mentioned is in the Paal and Roth publication Berichte, Volume 42, commencing at page 12 of the translation in evidence, in the Fokin article, Volume 38 of the Journal of
696 the Russian Physical Chemical Society?

A. I do not remember any other case offhand.

X Q. 239. And at what page of the translation was the mention made of cotton-seed oil in the Fokin article volume 38 of the Russian Physical Chemical Society?

A. On page 4 of the translation of pages 855 to 858.

X Q. 240. In the Paal and Roth reference to cotton-seed oil what are the characteristics and tests given of the hydrogenized cotton-seed oil product?

A. "The hydrogenized cotton-seed oil was a yellowish white, brittle mass which melted at 56-60 degrees and had an iodin number of 1.9."

That is one statement. Another statement is:

"The fat obtained by this second hydrogenation was an almost tasteless brittle mass, nearly white in color, which melted at 57-60 degrees and was readily soluble in carbon disulphide and in boiling chloroform but very difficultly soluble in alcohol and in ether. The iodin number was 0."

X Q. 241. Are there any specimens in evidence here comparable with that product?

A. Yes, sir.

X Q. 242. Which specimens?

A. Plaintiff's Exhibit No. 3. There are a great many specimens which are more or less comparable with it.

X Q. 243. Is this Defendant's W-1?

A. Yes. There are a great many exhibits which we have put in as being made by the Normann process, which are more or less comparable with it.

697 X Q. 244. Are any tests for the characteristics of hydrogenized cotton-seed oil products given in the Fokin article where you have stated the cotton-seed oil was referred to?

A. No, sir. I would like to add something to that. The article was referred to simply to show the incomplete hydrogenation of a vegetable oil.

X Q. 245. So that the only place in the prior art referred to in your direct examination where the melting point and iodin number of the hydrogenizing cotton-seed oil is given is in the Paal and Roth publication from which you have taken the figures given in your recent answer?

A. As far as I remember offhand now, yes.

X Q. 246. You have quoted from page 1 of the 1909 Paal and Roth publication Berichte, volume 42, the statement that hydrogenation was not complete. Taken in connection with its context, does not that quotation refer to a completion such as would be indicated by an iodin number of zero?

A. I think it does. In fact, the quotation says:

"With these fats, also it is rare that we could at once accomplish a complete hydrogenation down to an iodin number of 0."

X Q. 247. And it refers just above the portion that you quoted to iodin numbers having been obtained for various fats of .65 and .9, does it not?

A. Yes, sir.

X Q. 248. Immediately following your quotation from Paal and Roth on page 1 of the translation (Berichte, Volume 22), do you find the following sentence:

"In accomplishing this, the remarkable fact was established that that not only were the glycerine esters unsaturated acids
698 hydrogenated, but also certain other non-fatty unsaponifiable companion substances which were present to a slight extent in the original fats"?

A. I do.

X Q. 249. Does that indicate to your mind that at that stage of the art the possible non-fatty companion substances supposed to exist in fats in general would cut some figure in the hydrogenizing operation?

A. That statement undoubtedly refers to the fact that by the hydrogenation of these oils they obtained oils which did not give

the Holphen test and the Bechhi test, and so forth, and refers to those substances which caused these tests in oils.

Adjourned to March 28th, 1917, at ten thirty, A. M.

New York, Wednesday, March 28th, 1917—10:30 A. M.

Trial Resumed.

RAYMOND F. BACON resumed the stand:

Cross-examination.

By Mr. Gifford, continued:

X Q. 250. Professor Bacon, you stated yesterday that the Mellen Institute purchased certain Estabrook patents, I believe, as having claims covering the comminuted cotton-seed oil?

A. I did not intend to give the impression that the Mellen Institute purchased any patents. The Ward Baking Company purchased the Estabrook patents and the reason that they purchased
699 these patents was along with the idea of business safety rather than that they felt that they were absolutely essention to their operations; they felt that it was probably a wise thing to purchase them from the standpoint of general safety.

X Q. 251. Will you look at this volume of the Official Gazette of the United States Patent Office and state whether you understand patent No. 1,117,012 to Alvah W. Estabrook to be one of the patents you referred to?

A. I think it is.

X Q. 252. And among the claims given of this patent are there the following:

"(1) Wheat flour having mixed therewith in the dry state a comminuted hardened oil.

(2) Wheat flour having mixed therewith in the dry state a comminuted hardened oil produced from cotton-seed oil.

(5) An article of food in the raw state comprising a comminuted hardened oil."

A. Yes.

X Q. 253. As you understand it that article of food which is the subject of the fifth claim would be simply a substance like Exhibit W-1 ground up?

A. Yes, sir.

X Q. 254. Will you please state whether you understand patent No. 1,119,260 to Alvah W. Estabrook and Harry E. Weaver to be another of the patents you have referred to?

A. I am not sure whether we bought that one or not. It is possible we did because we bought some we really did not care for; simply because they insisted on selling all of them.

X Q. 255. And do you understand patent No. 1,105,638 to the

same patentees to be another of the patents you referred
700 to?

A. The same answer as the last will apply to this.

X Q. 256. The same question as to patent No. 1,101,015 to the same patentees?

A. The same answer as the last.

X Q. 257. Patent No. 1,117,012 from which I quoted three of the claims appears to have been filed November 24th, 1913; is that so?

A. That is correct.

X Q. 258. What operation do you understand to be referred to by the words "decomposed by dilute mineral acids," which occur in the quotation you made from the Normann patent?

A. The statement reads:

"Aside from the formation of small quantities of nickel soap which may be easily decomposed by dilute mineral acids no secondary reaction accompanies the reaction."

When he says "decomposed by dilute mineral acids" he means that the nickel soap may be removed from the hydrogenated fat by washing with the dilute mineral acids.

X Q. 259. How do you think that a chemist reading that statement at that time would have carried out this operation?

A. He would probably have taken fat in a melted condition and if it was a small quantity of fat he would have shaken it up with a dilute mineral acid in an apparatus of the type of a separatory funnel. If he was dealing with a large amount of fat the same operation would have been performed in a large tank with a conical bottom and the acid containing the nickel soap which has been removed from the oil is then drawn off from the bottom of the tank.

Such operations, as I have described, have been long known
701 in the fat business and are usual operations.

X Q. 260. What mineral acids do you think he would have used?

A. He would have used either dilute sulphuric acid or dilute hydrochloric acid; probably dilute sulphuric acid.

X Q. 261. Are either of these acids considered edible?

A. No, sir.

X Q. 262. Was nickel soap considered edible at the time of the Normann patent?

A. I rather doubt whether it was. I would wish you to understand, however, that in this process of washing with dilute acid none of the acid is left in the fat. The fat is purified by such a process and the acid separates at the bottom and is drawn off and I think that so far as any inference may be drawn from the statement that he makes with regard to the removal of the nickel soap that that inference would be that it was expected that this hydrogenated fat should be used for edible purposes because if it were not used for edible purposes there would be no particular reason to remove the nickel soap. If one were using it for soap purposes or for candle pur-

purposes the small amount of nickel soap that would be left in there would be of no consequence.

X Q. 263. What do you understand to be the range of the melting point of tallow?

A. Tallow melts at about 44 to 45 degrees centigrade. Lewkowitsch says that it melts down as low as 40 and I believe the upper range is about 46 or 47, but the average melting point of tallow is about 44 or 45 degrees centigrade.

X Q. 264. In the quotation you have made from the Erdmann patent it mentions "a low melting point tallow of 31 degrees."
702 What do you understand to be meant by that?

A. The translation you have is wrong. It says a low solidifying point of tallow.

X Q. 265. What do you understand to be the range of the solidification points of tallow?

A. The solidifying point as given by Lewkowitsch is 27 to 35 degrees centigrade.

X Q. 266. What kind of tallow do you understand this Erdmann patent to refer to at that point?

A. It does not say. It might have been beef tallow and it might have been mutton tallow.

X Q. 267. What do you understand to be the range of solidification points of hydrogenized tallow?

A. Tallow might be hydrogenized until it had a solidification point of some place about 55 and 60.

X Q. 268. You have stated that the Normann process is in commercial use in this country, I think, in three plants?

A. I said that I had seen it in three plants.

X Q. 269. And you spoke of the hardness of the product purchased in those plants. Do you know what its melting point is, the commercial product?

A. I know that in the plant of the American Cotton Oil Company the aim is to make quite a hard product, a product with a melting point around 55 to 60, we will say. Of course, they do not always do that. It is very much easier to hydrogenate to a lower melting point than it is to these very high melting points. Sometimes, for either trade reasons or because of the fact that the catalyser may not be particularly active that day, they may get lower melting points, but I think the aim is to make a product of a melting point of 55 to 60.

In the Larkin plant they do not aim to make such a hard product as a general rule, because they use this product for soap and
703 a very hard product of a melting point of 55 to 60 is not suitable per se for soap. They might make a very hard product, or they might make the less hard product. In the plant of the American Oil Products Company at the time I was there they were making a very hard product. It was about 55 to 60 melting point, and I understood that was their practice.

X Q. 270. In the plant that you mention as making it for soap, what do you understand the melting point at which they now make the commercial product?

A. I do not know in that particular plant, because I was there

one day and saw them run the apparatus that one day, and as I remember it the product that we made that one day had a melting point of about 45. But I understood from what they said that they made different degrees, but usually hard product. But they might make a softer product product for certain types of soap.

X Q. 271. Is refined cotton-seed oil chemically pure?

A. We do not use the words "chemically pure" except in speaking of individual substances and we do not use it in speaking in exact terms at all.

X Q. 272. Do you know what percentage about of unsaponifiable matter refined cotton-seed oil contains or may contain?

A. I do not know offhand the exact percentage; it is a small percentage, possibly one or two per cent.

By the Court:

Q. 273. In what sense is unsaponifiable matter used? What do you mean by that That means simply soap, does it not, or soap carrying?

704 A. We call those things saponifiable that can be used for making soap, really—that is, linolin is saponifiable, olein is saponifiable, and an oil is saponifiable, except that it may contain traces of other substances.

Q. 274. And which are used for the purpose of making soap?

A. They do not make sodium stearate or sodium oleate. We make what we call a saponification of an oil. That represents the total oleate and stearate and so forth.

Q. 275. Did you understand whether Mr. Gifford was using the word "saponification" in a purely technical sense?

A. I think he was, yes.

Q. 276. Or did you understand that he was using it in a more general sense?

A. I think he was using it in a technical sense. Of course, the total quantity of an oil goes into soap but when you examine it in a very careful quantitative way you could only say that maybe 98 or 99 per cent. of the actual oil was changed into these things, called sodium stearate or sodium oleate, which are soaps, and we call the rest of it the unsaponifiable.

Mr. Gifford: I was using it in that previous question as to the purity of the thing. I think it is used in that sense.

By Mr. Gifford:

X Q. 277. Do you know what this unsaponifiable matter in refined cotton-seed oil consists of?

A. No. No one knows I should say. It is present in very small amounts and no one knows. It is certainly edible, because we can eat the whole oil.

X Q. 278. In the experiments that you have described under the Paal and Roth publication were the operations stopped before the hydrogen stopped being absorbed?

A. The way in which our experiments were carried out was in

accordance with the general directions given in the Paal and
705 Roth article; that is, we carried out the hydrogenation first at the ordinary temperature. You see, Paal and Roth described a progressive reaction, and they described the amount of hydrogen that is absorbed over certain periods of time, from five minutes to ten minutes, and so on. We did exactly the same thing. We carried out the reaction until such time as the hydrogen was either not being absorbed more or was being absorbed very slowly. We then raised the temperature and allowed the reaction to go on until more hydrogen was absorbed. As I remember it, in our experiments we removed a sample at the stage where no more hydrogen was being absorbed, and that is one of the samples put in. In each case it is either S-1 run or T-1 depending on the S or T run. We then raised the temperature and allowed the reaction to proceed further. I do not believe in our experiments we allowed the reaction to proceed to absolute completion, because to proceed to completion would have taken a very large number of hours. In Paal and Roth's experiments as described in their articles very often the runs went over a period of possibly 24 hours, or something of that kind, in order to get complete absorption, but they measured the reaction from time to time by the amount of hydrogen absorbed, and they speak about the character of the product to a certain extent. In the case of cotton-seed oil they speak about how the product solidified out at the ordinary temperature and in the case of several oils they speak about the general character of the product at half way stages.

X Q. 279. You could have continued the experiments until you obtained the product described by Paal and Roth from cotton-seed oil—that is, the "brittle mass which melted at 56-60 degrees
706 and had an iodin number of 1.9," could you?

A. That could probably be done. I do not think there is any question but what it could be done. It would have taken a very long time, and of course Paal and Roth are simply describing in a scientific way the course of a reaction. They went just as far as they could and they got all intermediate stages. We did not go that far, because it would have meant nothing in this case and it would have taken an undue amount of time.

X Q. 280. And you could also have carried your experiments far enough to produce the product that Paal and Roth describe from cotton-seed oil as a "brittle mass nearly white in color which melted at 57-60 degrees and had an iodin number of 0"?

A. I would give the same answer to that as I did to the last question.

X Q. 281. In all of the patents and publications that you have referred to on your direct testimony, prior to November 10th, 1910, or any of them, do you find the statement that an hydrogenized vegetable oil was edible?

A. I did not find any statement in so many words that hydrogenized vegetable oil was edible; but I find various properties of the oil so given that I feel that any chemist would know that they might be used for edible purposes or for soap purposes or for candle making, or for any purposes for which fats of those properties are suitable.

X Q. 282. How long has the Mellen Institute been working on this bread problem about which you have testified?

A. They have been working on various problems connected with bread since about March, 1911. Not on this particular fat problem but on various other problems.

X Q. 283. Ever since that time have they been working
707 more or less on problems involving the employment of hydrogenized cotton-seed oil in bread making?

A. No, sir. The amount of time that was spent on the use of various shorteners in bread, I should say, at a guess, was about three months in investigating the field. In that three months' time, a very large number of oils of different types were tried, among which was the hydrogenized oil and hard oleo-starin, and a great many solid oils.

X Q. 284. When were those three months?

A. I cannot tell you offhand, but if you would like to have it I can put it in the record afterwards.

X Q. 285. About 1912?

A. No, not that long ago. It was about, I should say, in the beginning of 1915.

X Q. 286. When did you first know of the hydrogenized food industry?

A. I cannot say exactly. I started work on hydrogenized oils in general about the 1st of September, 1911.

X Q. 287. Had you heard of the hydrogenized food industry as carried on by Procter & Gamble at that time?

A. I am not sure about that. I do not know whether I had or not. We started work on hydrogenized oils at that time, and I know that at that time we talked over various uses for hydrogenized oils, but as to whether I knew anything about the fact that Procter & Gamble were in that field at that time I do not know. I doubt if I did.

X Q. 288. Who brought it to your attention?

A. I assume you mean who brought the hydrogenized oils to my attention. That work was started for Armour & Company.

X Q. 289. In the experiments that you tried under the Normann patent, were they stopped while the hydrogen was still being absorbed?

A. You refer to the experiments in Pittsburgh now?

X Q. 290. To those experiments, yes.

A. Yes, they were.

708 X Q. 291. And also the experiments at Berlin?

A. I think so.

X Q. 292. I believe you have said that in some of the publications to which you refer, the catalyst was palladium?

A. Yes, sir.

X Q. 293. Which publication was that?

A. In the Paal and Roth publication palladium alone is used. In some of the Fokin publications, I believe palladium alone was used.

X Q. 294. Is palladium a cheap or so-called precious metal?

A. Palladium is very expensive but for fat hardening purposes, I do not know that you could say it was expensive, because the amount

required is exceedingly small for fat hardening purposes, and in fact it had been patented for the purpose of hardening fats, and it is claimed by those who have patented it that it may be used practically as cheaply as nickel. If you asked me in terms of price per pound, it is exceedingly expensive metal.

X Q. 295. Do you know what the prices of nickel and palladium respectively are?

A. I know that the price of nickel is about fifty cents a pound, and the price of palladium varies very much, but simply as an approximation we will say it is somewhat more expensive than gold. I might say, though, that if you want to get the price in the terms of fat hardened, that the price of the two substances is pretty close or about the same, figured in terms of pounds of fat which they will harden.

X Q. 296. In the practice of the Paal and Roth process to which you have referred, how did you proceed with respect to the preparation of the catalyst and its application to the oils?

A. The catalyst was prepared in accordance with the ex-
709 act directions given by Paul and Roth. In the particular article that we are citing they do not give the exact directions but refer to an article previously written by Paal and Amberger, in which the exact directions are given, and those exact directions as given by Paal and Amberger and referred to by Paal and Roth are followed.

X Q. 297. Will you describe them, please, and describe what was done?

A. My notes simply say that these directions were followed. I have not all the details here.

X Q. 298. Do you remember whether an oil emulsion with gum arabic and water and colloidal palladium was made?

A. Yes, sir.

X Q. 299. It was made, you say?

A. I think it was.

X Q. 300. And after hydrogenization was it extracted by chloroform filtered and evaporated?

A. I think so; yes, sir. Those were the directions given by Paal and Roth and that is exactly what we did.

X Q. 301. Do you know whether that process has ever been developed to a commercial stage?

A. A process based on the work of Paal and Roth has been developed to a commercial stage, as I understand, yes sir. At least there are patents which purport to say they are based on this work. Of course, in a commercial way nobody would ever extract with chloroform or anything of that kind. When we do things in a laboratory we use a somewhat different apparatus than the apparatus we use on commercial scale. We always do.

X Q. 302. But processes have been developed in a commercial way in which an oil emulsion with gum arabic water and colloidal palladium was made, and those processes have been practiced,
710 as I understand it?

A. No. In a commercial way, as I remember the patent, they do not use gum arabic. It is not necessary. In the laboratory we do a great many things, that as we get into the commercial plant

we simplify, and the commercial process based on this work of Paal and Roth is, of course, simplified compared to what Paal and Roth did in the preliminary way.

X Q. 303. But you are not prepared to say that any commercial process has been developed which followed the directions of Paal and Roth which you followed in your experiments?

A. I am prepared to say that a commercial process has been developed which is based on the work of Paal and Roth just as much as any commercial process is based on any laboratory work.

X Q. 304. But you are not prepared to say that any commercial process followed the directions of Paal and Roth as you have followed them in your experiments?

I am not speaking of what may be based on it, but I mean following it. A. I would say that the commercial process follows it about as closely as any commercial process could follow laboratory work of that general character. I have already said that they certainly do not emulsify with gum arabic and they do not extract with chloroform. No one would think of doing things of that kind on a commercial scale.

By the Court:

Q. 305. Were they done by Paal and Roth because that was the only way to do them—that is, that was known and that was practicable—or were they done in order to make a more delicate and scientific experiment? Can you state that from your knowledge
711 of the art?

A. I think at the time that Paal and Roth did these experiments this particular way that they did them was the way that they would have been done at that time, and Paal himself went ahead and developed the thing on a commercial scale and sold it to some company.

Q. 306. Made in that way?

A. That is, he used palladium. He did not, as I remember the commercial method, emulsify it with those things. I am referring now to patent No. 5,188 of 1911, issued to Dr. Karl Paal. In this patent he refers to the work which was done by himself and his assistant, Dr. Roth, on the hydrogenation of oils. Probably to answer your question better, he speaks about the fact that if you use gum arabic the recovery of the valuable gum arabic is a tedious and expensive process, and so forth, and he speaks about the large volume of solution that would be required if he followed exactly the laboratory method. Then he goes on to give the method which he had given.

X Q. 307. Was the method called for by this patent, the method used either by the plaintiff or defendant here?

A. No. It has never been used in this country, so far as I know.

Mr. Gifford: I would like to have this copy of the patent that is referred to marked for identification, patent to Paal No. 5,188 of 1911.

Marked Plaintiff's Exhibit 14 for identification.

By Mr. Gifford:

X Q. 308. In the Paal and Roth publication of 1909 Berichte, Volume 42, on page 4 of this translation I find this.

712 "For this reason, the only way to account for the excess hydrogen is to assume that some other reduction took place, as, for example, the reduction of glycerides of the oxy-fatty acids or a reduction cleavage of the glycerides into aldehyde and alcohol."

I understand this statement to be made as accounting for the excess of hydrogen above the theoretical, which Paal and Roth found necessary in hydrogenizing, and which they could not account for from any leakage that occurred. Is that your understanding of it?

A. That is what they say, but we know both from calculation and, I believe, from a later article—I cannot cite you that reference just now—that they found this excess hydrogen really was due to leakage. The statement they make there could not possibly be true, because the amount of hydrogen which they had absorbed in many of these experiments was at least four times the theoretical, and even if certain of these things had been reduced in the way that they speculate they might have been reduced, it would not have taken anything like that much hydrogen.

X Q. 309. You have no doubt they believed the statement to be true at the state of the art in 1909, do you?

A. They certainly make the statement. I have not any reason to.

X Q. 310. The other or side reductions that they mentioned as taking place were in the first place the reduction of glycerids of the oxy-fatty acids. What do you understand they refer to there by the oxy-fatty acids?

A. Certain oils, as for example castor oil in particular, contain quantities of oxy-acids. That is, they might contain oxy-oleic acid and that oxy-oleic acid might be reduced.

713 X Q. 311. What is the nature of the oxy-oleic acid?

A. In what respect do you mean?

X Q. 312. Please describe it.

A. Probably a colorless liquid.

X Q. 313. What are its characteristics, if you know? Have they been determined?

A. I imagine that a great many of the properties of oxy-oleic acid are described in the literature. I cannot give them offhand.

X Q. 314. You do not know them now?

A. I know that it is a colorless oily liquid with a certain formula. I can give you the formula. I do not know what you want about it.

X Q. 315. What are its physical and physiological and chemical characteristics, if you know?

A. The chemical characteristics are very similar to those of oleic acid. It could absorb iodin the same as oleic acid. It can take up hydrogen the same as oleic acid can. It belongs to the group of unsaturated acids. There is a physiological action. I do not know. I think you would find the statement some place that the purging properties of castor oil are due to acids of the type of oxy-oleic acid. You will also find statements that they are not due to that substance,

because as a matter of fact we do not know in the case of castor oil to what the purgative properties are due.

X Q. 316. Do you know the physiological characteristics of the oxy-fatty acids of other oils, this statement being a general statement, as I understand it, by Paal and Roth, not applied to any oil in particular?

A. I do not know. I do not think, though, that the glycerids of the oxy-fatty acids are at all poisonous in character, if that is what you are trying to get at.

X Q. 317. But you do not know?

A. I am not sure at all; no, sir.

714 X Q. 318. Would there be such a thing as an oxy-linolin?

A. There might be.

X Q. 319. Where would the oxygen be joined on?

A. The oxygen might be any place in the chain. Do I understand you to speak about an oxidized linolin or a compound which would be an oxy-linolin or an hydroxy-linolin, to be more exact?

X Q. 320. I mean referring to the statement of Paal and Roth applying it to linolin acid, what would be the glycerid of the oxy-fatty acid in that case?

A. I am not familiar with the glycerid of oxy-linolic acid.

X Q. 321. And you do not know whether the oxygen would be joined on at the two double bonds of the linolic acid or not?

A. If one oxidizes linolic acid or linolin or any compound containing a large amount of linolin, the oxygen goes to the double bond. That is our assumption in every case. When we speak of an oxy-linolic acid that is not the same thing as an oxidized linolic acid or an oxidized linolin. When we speak of an oxy-linolic acid or an oxy-linolin we are speaking about a definite compound which might have the oxygen at any position in the chain. If you are speaking about an exidized linolin, or an oxidized linolic acid, the oxygen goes to the double bond or goes to the position of the double bond.

X Q. 322. And for that reason linolin would be more receptive of oxygen than olein, I suppose?

A. Yes, sir; there is no question about that at all. Linolin oxidizes much more easily than olein.

X Q. *233*. And the great amount of linolin in an oil the more susceptible to the reception of oxygen?

A. All other conditions being equal that is true; yes, sir.

X Q. 324. At the same point that I have quoted from Paal

715 and Roth mention as the other reductions possibly taking place. A. "Reduction cleavage of the glycerids into aldehyde and alcohol." What are the characteristics of aldehyde?

A. There are a larger group of substances called aldehydes. They are characterized by great activity. In what regard do you want to know?

X Q. 325. I mean among other things the physiological characteristics of aldehydes?

A. Some aldehydes are quite poisonous.

X Q. 326. As you understand the Normann patent did they start with crude cotton-seed oil or refined cotton-seed oil?

A. They did not say at all. They do not say whether they started with crude or refined. They indicate in a way that you might start with either one because they speak about the fact that you may start with pure oleic acid or crude oleic acid. I believe the same thing in the case of tallows. The presumption is you can start with chemically pure oleic acid, or crude oleic acid and that you might start with refined cotton-seed oil or crude cotton-seed oil.

X Q. 327. In your experiments with the Normann process at Pittsburgh did you put the catalyst in oil to preserve it?

A. Put it in oil to prevent oxydation, yes, sir.

X Q. 328. Is that described in the Noramnn patent?

A. That is not described in the Normann patents, but it is very clearly indicated by many later publications that were made on this whole subject, publications, all of which are long before the time of the application for the Burchenal patent.

X Q. 329. But those publications have not been referred to in your direct testimony, as I understand it?

A. I think I referred to the publications of Sabatier and
716 Senderens that give one all the information desired on the subject.

X Q. 330. But so far as you know it has not been offered in evidence?

A. I do not know what has been offered on evidence in that regard. I might say further that the Normann patent itself starts out by saying that it is based on work of Sabatier and Senderens and there it tells people where to get information about making the catalyst, and I think in that regard the Normann patent in itself really gives all this information, because it refers directly to the men who have done the principal work on methods of making this catalyst and methods of handling it.

X Q. 331. When cotton-seed oil is hydrogenized with a nickel catalyser is heat produced or absorbed?

A. Heat is produced.

X Q. 332. The commercial processes that you referred to as being the Normann commercial process are of recent years, are they not?

A. Yes, sir.

X Q. 333. That is subsequent to November 10th, 1910?

A. I think so, in every case.

Redirect examination.

By Mr. Pennie:

R. D. Q. 334. In your cross examination reference was made to the Corby machine used by the Ward Baking Company in incorporating liquid cotton-seed oil into the dough batch. Please produce an illustration showing that machine in its general features.

A. I produce English patent No. 211 of 1900 to William Stephen Corby, Charles Israel Corby and Theodore Jacob Mayer, and I believe that in its essential features this represents the Corby mixture.

R. D. Q. 335. This, as I understand it, is the type of machine that

is used by the Ward Baking Company, and has been used for
717 years in the incorporation of liquid cotton-seed oil in the dough batch?

A. Yes, sir.

R. D. Q. 336. And is this same type of machine unchanged and used likewise for the incorporation of the dough batch of the material of fluorescein—or that is to say, the hard fat absorbed in flour?

A. It is, absolutely. No change was made in the machinery in any regard when the hard fat was put into use.

Mr. Pennie: I offer in evidence English patent No. 211 of 1900 to Corby and others.

Marked Defendant's Exhibit J-2.

R. D. Q. 337. You have also been asked to state the appliances that are used for the incorporation of the hard fat in the flour. Are those standard apparatus or otherwise?

A. The appliances were used on the standard apparatus. None of them were especially built to order. They were simply standard appliances.

R. D. Q. 338. Is it likewise true that this same type of Corby Mixer is used for the incorporation of lard and lard compounds in the dough batch?

A. Yes, sir; it is used for the incorporation of any particular fat that they might happen to use as a shortening agent. It is equally applicable to one fat or another fat. No change is made when the fat happens to be changed.

R. D. Q. 339. Will you please state what this material is that I now hand you in this glass jar?

A. This material is some of the material known as fluorescein. It is mixture of fat and flour referred to in previous testimony.

718 Mr. Pennie: I offer the material in evidence.

Marked Defendant's Exhibit K-2.

R. D. Q. 340. In the second Paal and Roth article, that is to say, their article of 1909, to which you have referred, the following appears on page 8 under the heading "Olive Oil":

"By the reduction of this fat we have obtained, as published in our former communication, a solid melting at 43-47 degrees with an iodin number 9."

Further on in the 1909 article it appears that the original olive oil of iodin value 81 was reduced; that is hydrogenated, in the manner already described, and thus a tallow like product was obtained with iodin number 39.7.

How do you account for the fact that Paal and Roth thus obtained by the same method as they say products of iodin value 39.7 and also products of iodin value 9?

A. This reaction of hydrogenation is a progressive reaction. The iodin number is gradually reduced and if they happen to stop at a certain point, they might obtain any iodin number from 81 down to

0. In the particular cases you have cited they happened to stop the reaction, one when they had an iodin number of 39.7 at which point they obtained a tallow like product, and in the other case where they had an iodin number of 9 and obtained a product of melting point 43.47. This reaction is, as I have said, a progressive reaction, and, of course, might give products of any melting or iodin number within the range specified.

719 R. D. Q. 341. You have referred both in your direct and cross examination to the product obtained by the practice of hydrogenation at the Larkin plant. What was the material there being hydrogenated?

A. It was refined cotton-seed oil.

R. D. Q. 342. What was the product, edible or inedible?

A. It was certainly edible.

R. D. Q. 343. Are hydrogenation fats of the hardness of the product put in as Plaintiff's Exhibit 3 adapted as such to the manufacture of soap?

A. No, sir.

R. D. Q. 344. What must be done to them before they can be made into soap?

A. The melting point must be lowered. They must be mixed with other fats. One could make a soap out of a fat of this kind, but it would not be a commercial soap. When hard fats are used for soap making they are always mixed with softer fats and in that way they obtain a fat of the desired consistency. This is usually regulated in terms of titer; desired titer.

R. D. Q. 345. The blending of the hard product with the other fats is for the purpose of lowering the melting point of the composite whole, so that it is adapted to be made into soap; is that true?

A. Yes, sir; that is correct.

R. D. Q. 346. What is the material that I now hand you?

A. This is an oleo-stearin.

R. D. Q. 347. What is the titer?

A. The titer of this oleo-stearin, this particular sample, is 53.4.

R. D. Q. 348. Is this the material that is used as an addition to liquid cotton-seed oil in order to make lard compound?

A. Material of exactly that type; yes.

R. D. Q. 349. And in what proportions?

A. In approximately the proportion of from ten to fifteen per cent. of oleo-stearin to 85 to 90 per cent. of refined cotton-seed oil.

720 Mr. Pennie: I offer this sample of oleo-stearin used in making lard compounds in evidence.

Marked Defendant's Exhibit L-2.

R. D. Q. 350. I show you another hard fat; what is this?

A. This is also oleo-stearin.

R. D. Q. 351. Of what titer?

A. 50.5 titer.

Mr. Pennie: I offer this sample in evidence.

Marked Defendant's Exhibit M-2.

R. D. Q. 352. Are these oleo-stearins likewise used in the manufacture of soap?

A. Yes, sir.

R. D. Q. 353. In the same way that hardened cotton-seed oil is used?

A. Yes, sir; they are blended with other oils.

R. D. Q. 354. So that they are indifferently a food product or a soap product?

A. Yes.

R. D. Q. 355. In the Paal and Roth articles reference is made to the fact that the hydrogenation of croton oil makes that oil non-poisonous; are you acquainted with any citation or any statement in the art to the effect that the hydrogenation of an oil which is otherwise edible would at any state of such hydrogenation make it inedible?

A. There is no such statement and such is not the fact. In fact, hydrogenation never makes an edible oil inedible.

R. D. Q. 356. In your direct examination you referred to a hydrogenation carried on on November 27th at the laboratory of the Berlin Mills Company illustrative of the Paal and Roth process and that notes were taken of that hydrogenation; are these the notes (indicating)?

A. They are.

721 Mr. Pennie: I may say that these are the notes that were introduced in the taking of Mr. Richter's deposition.

The notes referred to by the witness and which have been marked for identification Defendant's Exhibit N-1 are now offered in evidence.

Marked Defendant's Exhibit N-1.

I may also say in this connection that copies of these notes have been in the possession of the other side over night.

R. D. Q. 357. Are the Paal and Roth products which you produced at Berlin Mills and at the Mellen Institute laboratory as testified to by you edible?

A. They are.

R. D. Q. 358. Referring to one of your experiments at the Mellen Institute concerning the batch process you stated that it was not successful; what did you mean by that?

A. I take it you refer to some experiments made on December 3rd?

R. D. Q. 359. Yes.

A. On that date we tried to harden oil in a flask in the general procedure which we have been calling the Normann process, and the oil did not become hard. The reason for that was that the catalyser was not active, and I take it that the reason that the catalyser was not active was because we in some way slipped up on following the directions that are in the literature for preparing such nickel catalysers.

R. D. Q. 360. In ordinary domestic economy are mixers used in

the kitchen by the cook for various purposes, particularly in the making up of dough batches and the like?

A. Yes; there are a number of kitchen bread mixers that are on the market; very largely used.

722 R. D. Q. 361. Are these efficient forms of apparatus?

A. Yes, sir; they are a very convenient form of apparatus; they make good bread.

R. D. Q. 362. You were likewise asked on cross examination as to the oxidation of linolin. Does the oxidation of linolin have anything to do with the rancidity of the product?

A. I think it does; yes. I think that substances may become rancid due to many different conditions. An oxydation under certain conditions would make a substance rancid.

R. D. Q. 363. Have you made any comparative tests to ascertain the conditions of rancidity as applied to different kinds of fats containing linolin?

A. Yes, I made some tests on a number of lard and lard substitutes and determined the rate at which the different ones become rancid; that is, the comparative rate.

R. D. Q. 364. What were your results?

A. The substances used—I will give them in the order in which they resist rancidity—are, first, Armour's Simon Pure Lard; second, "Crisco"; third, "Kream Krisp"; fourth, lard compounds prepared from 80 per cent. cotton-seed oil and 20 per cent. oleostearin; and fifth, lard compounds prepared from 90 per cent. cotton-seed oil and ten per cent. hardened cotton-seed oil.

I say that these exp-riments demonstrate what we would expect from the chemical character of these products. The product of the type of "Kream Krisp," which has a great deal of linolin in it, all other conditions being equal, becomes rancid very much more rapidly than a product containing less linolin, of the type of lard or of the type of "Crisco"; that is, "Kream Krisp" judged from a rancidity standpoint, or judged from its composition, is a very dif-

723 ferent compound from either "Crisco" or lard, and even more difficult from the compound more narrowly described by Burchenal in the range of component glycerids.

R. D. Q. 365. In these rancidity tests which you ran, how closely did "Kream Krisp" and lard compounds run with respect to their resistance to rancidity?

A. "Kream Krisp" is very much like lard compound in regard to becoming rancid. It becomes rancid very much the same as lard compound does, and one would expect that, of course, from its composition, as it is very close to lard compound in its constituents, so far as linolin, olein and stearin are concerned.

R. D. Q. 366. In order to refresh our minds on that subject while we are now on it, will you please state generally what is the amount of linolin on the average in "Kream Krisp" and the amount of linolin on the average in lard compounds?

A. In "Kream Krisp" there is 37 to 38 per cent. of linolin, and in lard compounds about 41 to 42.

R. D. Q. 367. These linolin constituents are indicated on chart 402 as close together, are they not?

A. Yes, sir.

R. D. Q. 368. And where on that chart appears the linolin content of the product referred to in the patent in suit; that is, the one containing from five to ten per cent. linolin?

A. That is a considerable distance away from these compounds you first referred to, and is represented on that chart by a four sided figure; the range is represented by a four sided figure.

R. D. Q. 369. And the linolin content of cotton-seed oil, where is that represented on the chart?

A. That is given on the chart as 46.

R. D. Q. 370. That is in close vicinity to the "Kream Krisp" product and in close vicinity to the lard compound specified there
724 as the "Jewel" compound?

A. It is rather close to both of those.

Recross-examination.

By Mr. Gifford:

R. X Q. 371. In your re-direct examination your attention has been called to the Paal and Roth 1909 publication, Berichte, Volume 42, under the heading "Olive Oil," where it speaks of the production of an iodin number of 39.7. What does it immedately say was done with that substance?

A. "Of this product 1.8 grams was taken for further hydrogenation."

R. X Q. 372. So that the only use stated for that 39.7 iodin number substance was to continue the hydrogenation of it, as I understand it?

A. I would not say the only use of it. What Paal and Roth were doing, they were studying the reaction and they obtained many different products. It would have been ridiculous if they had attempted to separate out each product of each single iodin number as they went——

R. X Q. 373. Do they say that anything more was done with it excepting to take it for further hydrogenation?

A. In this particular case the only sentence I see there is "of this product 1.8 grams was taken for further hydrogenation."

R. X Q. 374. And when they got the final product by the further hydrogenation, what was the iodin number and what was the melting point?

A. The melting point was 68.5 and the iodin number was 0.

R. X Q. 375. In this English patent to Paal, No. 5188 of 1911, to which you referred is the following:

"The technical application of this method of Paal and Roth to the catalytic reduction of the fats and unsaturated fatty-acids
725 according to Dr. Normann's said patent is, however, hindered by the high price of colloidal palladium which after each hydrogenation is transformed into the active ge-l form by the procedure necessary for isolating the product of the reduction,

Moreover, in using this method of Paal and Roth, the fats must be converted into emulsions prepared by means of gum arabic, and the unsaturated fatty acids must be converted into aqueous solutions of their alkali salts. In order to reduce large quantities of these substances, very large volumes of liquid are therefore required. The recovery of the valuable gum arabic is also a tedious and expensive process. If attempts be made to replace gum arabic by other cheaper emulsifying agents—for example, solutions of soap or of saponin—the fatty emulsions thereby obtained are not reduced by palladium sol. and hydrogen."

A. Yes.

Redirect examination.

By Mr. Pennie:

R. D. Q. 376. This same British patent, No. 5188 of 1911, likewise contains the following paragraph, does it not, under the heading, "The reduction of fats"?

"The reduction process may also, of course, be carried on in such a manner that only partial reduction ensues. These partially reduced fats then exhibit a lowered melting point and a consistency resembling ointment.

The degree of hydrogenization can be determined by ascer-
726 taining the iodin value."

Mr. Gifford. I object to that question, if your Honor please, on the ground that it is entirely immaterial, because this patent referred to is not part of the prior art being subsequent to the date of the application of the patent in suit.

Mr. Pennie: I do not advance this as an anticipation or on the prior state of the art, but merely as showing that anyone even in the absence of information of any kind as to the subject matter of this patent would naturally know, and as a matter of course know that the reduction could be interrupted halfway. It is therefore competent upon the argument addressed to the question of the patentability of the subject matter in question.

Objection overruled; exception.

A. Yes.

Recess.

R. D. Q. 377. In your direct examination you were asked whether there had been introduced in evidence any of the Sabatier and Senderens publications relating to hydrogenation and to the manufacture of catalyst, conditions of temperature and the like. Will you please produce one of those publications?

A. I now produce such publication. This is a publication by Sabatier and Senderens in Annalen de Chimie et de Physique of the year 1905, pages 319 to 324, 331 to 337 and 486 to 487, together with the translation.

Mr. Pennie: The article referred to and the translation
727 thereof are offered in evidence as the Sabatier and Senderens publication.

Marked Defendant's Exhibit N-2.

R. D. Q. 378. Will you please state what the publication is I now hand you?

A. This is the inaugural dissertation of Fred Bedford published from the University of Halle, Germany, in 1906. The title of it is "On the unsaturated acids of linseed oil and their quantitative reduction to stearic acid."

R. D. Q. 379. Does this publication contain data as to the temperatures to be used in the hydrogenation of oils by the use of a nickel catalyst?

A. It does.

R. D. Q. 380. And the translation is a translation of the second part of the same, is it not?

A. Yes, sir.

Mr. Pennie: The publication and the translation are offered in evidence.

Marked Defendant's Exhibit O-2.

Mr. Pennie: I may say in this connection that these publications and the translations of them have been in the hands of counsel for the plaintiff for some months past.

R. D. Q. 381. Is the information contained in these publications complete as to the necessary conditions for the production of an effective and durable catalyst, the temperatures required for hydrogenation and the means to be used in preserving the integrity of the catalyst so as to keep it catalytically active?

A. It is quite complete in all these things.

R. D. Q. 382. And is that information likewise contained in other publications prior to the year 1908?

A. Yes, sir.

Defendant rests.

728 *Plaintiff's Rebuttal Proofs.*

CHARLES BASKERVILLE, recalled in rebuttal, testified as follows:

Direct Examination.

By Mr. Gifford:

Q. 107. What can you say as to the correctness and significance of the chart referred to in defendant's testimony as No. 402, being the triangular chart referred to in the depositions of the witnesses Richter and Bacon and similar, I believe, to one referred to in the deposition of Dr. Walker as chart No. 10?

A. Essentially it is wrong in principle and incorrect in that it

I.

G ≡ glyceral rad. $C_3H_5-\equiv$

P – Palmitic rad = $C_{15}H_{31}CO_2-$

S – Stearic rad = $C_{11}H_{35}CO_2-$

O – Olic rad = $C_{11}H_{33}CO_2-$

L – Linolic rad. = $C_{17}H_{31}CO_2-$

$C_{13}H_{28}$

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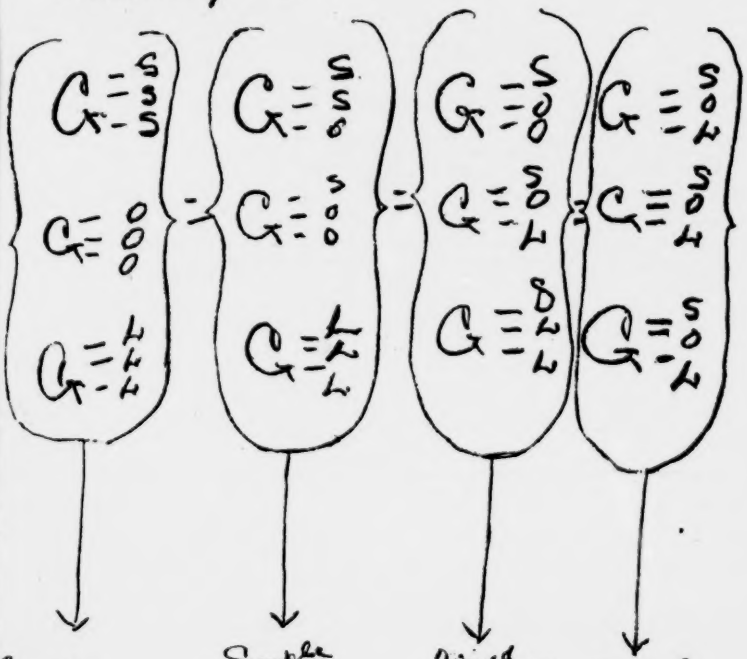
II-

Omitting P_



Simple glycerides | Simple + Mixed glycerides | Mixed glycerides | Mixed glycerides

All make mixture of glycerides

#33.

Berlin Mills Co. v. Procter & Gamble Co. } Ø 7286

purports to compare two substances or two classes of substances, namely, cottonseed oil and products derived from cottonseed oil by hydrogenation, which are not accurately comparable on a chart of this character. In the second place, the chart is misleading because the basis of comparison is not the essential or material change undergone by an oil during the process of hydrogenation, and with the consent of the Court I would like to develop that point.

I refer to Chart I for the sake of simplicity, if it please the Court. I have designated the radical which is so well explained by Professor Walker, the radical of glycerol by G. We will use that for convenience sake. It has this actual chemical composition, or that is the way we write it. Palmitic acid radical is designated by the letter P, and in that connection I will call your attention to this formula of palmitic acid radical. This is the radical, namely, $C_{15}H_{31}CO_2$, and then there would be another H in it if it were palmitic acid, but that H is taken off, so that it can have a hand to grasp.

(Here follow diagrams marked pp. 728*a* and 728*b*.)

729 By S is meant the stearic radical. This is the one spoken about a little, and this is the formula of stearic radical (indicating). By O we will designate olein, and this (indicating) is the formula for the oleic radical. You will observe the difference essentially at least as indicated here between oleic and stearic is two hydrogen atoms, H_{33} and H_{35}. Then linolic is designated by the letter L. You will observe that that has a formula $C_{17}H_{31}CO_2$, and it also, of course, has its hand. That, you will observe, has two less hydrogen atoms than the oleic, and hence four less than the stearic. We will just use these designations to simplify things.

I next refer to Chart II. For the time being, omitting consideration of the palmitic radical and considering only stearic, oleic and limolic, we can write out at least four forms in which we might have such a mixture of stearin, olein and linolin. I would like you to observe this very closely, as it is very simple, and I know how difficult it is to get hold of the chemical symbols or designations. Here we have one molecule of stearin, and the glycerol in the three. In the *L* we have one molecule of *O*—you see all three *O's*—and the *L* we have one molecule of three *L's*, in other words, this would be pure stearin, pure olein and pure linolin. Those are what we call the simple glycerids, they are all the same radical.

Now, here we have in this case the *G* with two hands, one hand each with a stearin and a third hand linolin. Here we have with one stearin and two of olein, and here this one remains still simple.

Those three mixed together give us a glycerid, a mixture of glycerids. As you see, it has a simple glycerid and two mixed ones. Suppose we go just a little bit further; suppose we

730 take this case here, where the *C* has one stearin and two *O's*. Here we have one stearic radical, one oleic radical and one linolic radical. That is also a mixed glycerid, as is this (indicating). Our third glycerid begins to become mixed also, or is mixed. Here we have the glycerid with the stearic and the two linolics. In other words, we can get quite a number of combinations until eventually we get here *G* with one stearic, one oleic and one linolic. *G* with exactly the same and with the third *G* exactly the same (indicating).

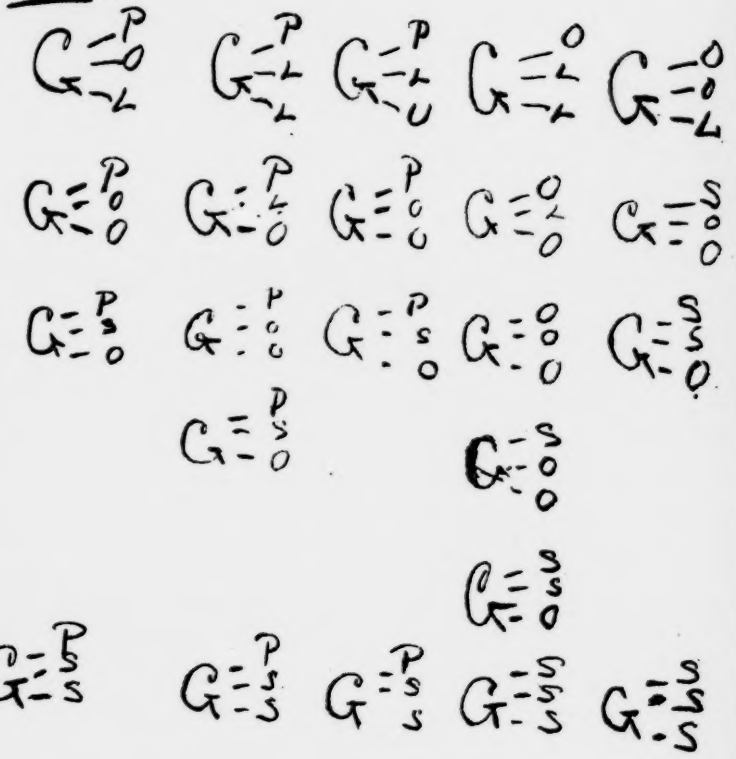
Then we have all three of those, a mixture of glycerids, with exactly the same composition.

By the Court:

Q. 108. It may be a perfectly homgeneous mixture, may it not?

A. All of these could be made a homogeneous mixture, all of them. That is one of the points I want to impress upon your Honor. If you will observe here in any one of these just imagine between the brackets, as being a unit, an oil that contains these three glycerids; in any one of those, if we count up, we will observe that we have here three *G's*, and here three *G's* and here three *G's*—three *G's* in every one of them, and also three *S's*, one, two, three (indicating)—in all of them. We have three *O's* in all of them and we have three *L's* in all of them.

III.



Progress of Hydrogenation.

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In other words, I want to bring out this point, namely, that we may have these mixtures of glycerids which constitute certain oils or fats which may be made up chemically of a number of different chemical individuals, and the methods that are usually used to determine the ratio of what is designated as olein and what is designated as linolin depend upon the iodin absorption.

(Here follows diagram marked p. 730a.)

731 By Mr. Gifford:

Q. 109. What does *G* mean there?

A. That is from glycerine. That is the radical with which they all combine. When you break up a fat, you decompose it to make the soap and you get glycerine.

Q. 110. Those other symbols are the molecules?

A. The radicals. Each one can join to three. This one can join to three and these each can join to one.

Now, the method for determining the ratio referred to depends upon getting the total iodin absorption. Where each *O* is two iodins, and where each *I* will be four iodins, that is short four atoms. By that method we would be absolutely unable to tell the difference among these.

Here there are four different things. They are hypothetical and I do not want to say they are actually in existence, but I want to lay this foundation for what follows. So that the iodin absorption does not tell us really the composition of those, and many of them we do not know. We have to confess—we do not know.

Now let us go to chart 3.

Q. 111. You mean the composition of those glycerids?

A. This is a unit, you see. It is a mixture, it is an entity, composed of three constituents and so here (indicating).

Look at chart 3 and bring before your consideration the *P*, the palmitic, which is found a constant constituent in cottonseed oil. This is not the truth, as far as I know, or the actual fact, but it serves to illustrate the point most satisfactorily, at least to my mind and it is perfectly convincing to my mind.

732 If we take the *G* here we have the palmitic radical with one olein and one linolin. We have here the palmitic, the two linolins, and here this is just practically the same as this, we might say. There are two of those. Here we have, without any palmitic, olein and two linolins, and here two oleins and linolin. They might be joined up differently. For example, they might have all three *O's* the same in that case, or three *L's*, but the fact remains that in this first layout there we have three palmitic radicals.

We have five olein radicals and we have seven linolins as may be seen, and it happens that, if we make an analysis of that by the ordinary method it shows almost a composition of normal refined cottonseed oil, in so far as we consider the glycerids alone. It will show palmitin, olein and linolin. I would like to submit these figures with the privilege to correct them.

Let us see what happens to that in the process of hydrogenation. We need not consider them, the processes, but just simply say we are going to get hydrogen in there, we are going to change some of these *L's* to *O's*, and probably some of the *L* to *S* and so on. If we look at the next line you will observe that here *O* has been introduced in place of this *L*. *O* has been created as it were. This *L* has been changed into *O*, this *L* has been changed into *O* and this *L* has been changed into *O* (indicating). And we can imagine that this *O* has been changed into an *S*, as the stearic, taking on four hydrogens—or we could have any other changes.

But that brings us to the point for the first time of introducing into our mixture of glycerids, stearin. Now, that, with the
733 possible exception of the two per cent. stearin which it has been stated here in evidence exists in cottonseed oil—that I have not seen the publication of, and I await it, but excepting that, with that exception, this is the first introduction of the stearin into our mass, our entity. Now, these substances continue the hydrogenation—they may go one way or they may go another way, according to the process.

Q. 112. What do you mean by one way or another way?

A. I do not thoroughly understand myself one thing. I do not thoroughly understand the full influence of pressure and the full influence of temperature, veering them up and down in carrying on the mechanism of some of these processes. But eventually if it is completely hydrogenated we then observe we have changed that which was originally containing one molecule of palmitic acid, and we have here the G, the P and two S's. And then we have the tri-stearin made. That hard solid body corresponds approximately to this material here (Plaintiff's Exhibit No. 3).

Now, the point in that connection is the following: We do not actually know the ratios of these different mixed glycerids. We do not know some of them. We do not know whether they actually exist. We do know that we get certain groups of bodies that are liquid, and we do know that we get certain substances that are solid.

I would like to get very clear in mind that we have here in this solid present the palmitic radical and the stearical radical joined to the glycerine. We have in the liquids the linolin and olein which may have various compositions. In other words, the chemical composition there, the actual chemical composition is not definitely and positively known.

734 By the Court:

Q. 113. When you say "there," where do you mean; you say "actual chemical composition there"?

A. Of this mixture of glycerids and oils.

Q. 114. When it gets to be perfectly hydrogenated is it known any better?

A. It would be known in this way; that it could not be otherwise very well because they all lead up practically to the same thing.

Now, just this point. I happen to know that if you take a compound with 13 carbon atoms and 28 hydrogen atoms, there are 802 possible different combinations that would give different substances, with C_{13} and here we have substances which involve C_{18} and C_{17}, and three times those figures plus this (indicating), so the possibilities of combinations are so great that I do not feel that we have a right, therefore, to classify these substances on the basis of the chemical composition alone.

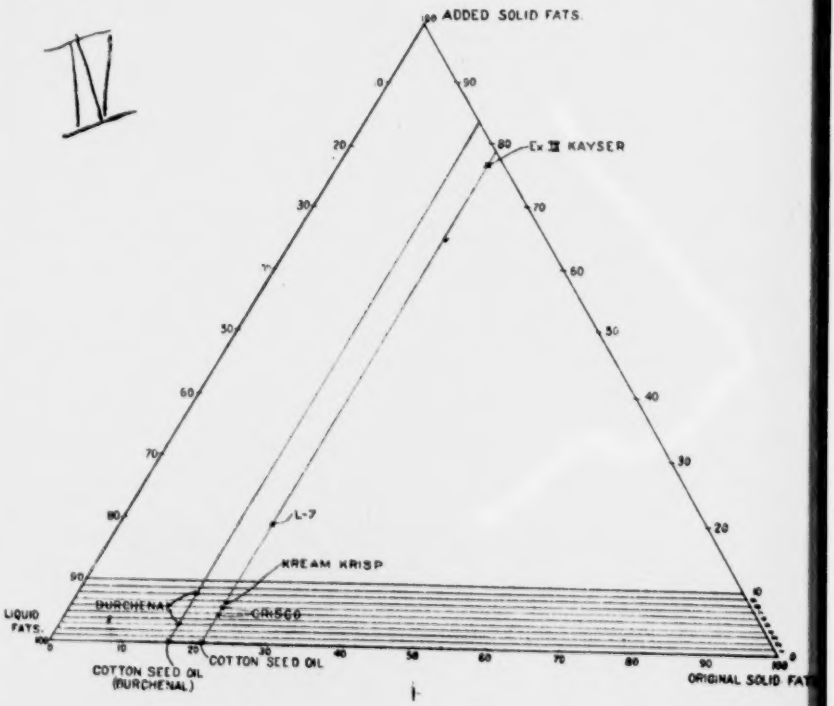
I will now refer to defendant's triangular chart 402. In it the classification is based on a chemical composition as indicated, in

which the components are what are called glycerids, linolin, a liquid; olein, a liquid, and the saturated glycerids which are solid. It would seem to me, therefore, that defendant's chart 402 is essentially incorrect in so far as one of the particular points we are concerned with here, is that of the saturated glycerids. The term "stearine" used, is a mixture; it is solid. Linolin may be a mixture; it is a liquid. This (indicating) olein may be a mixture, and it is a liquid. But when we hydrogenate we are adding to—if we start out with cottonseed oil, we are adding to it more of a saturated

Here follows diagram marked p. 734a.

A

IV



433.

Berlin Mill Co.
v.
Procter & Gamble Co } D 734 a

735 body, but of an entirely different chemical composition. During this case the term "stearin" has been used a great deal. It has not been used with any intention, of course, of misleading, but it happens that that is a term which is used to include saturated glycerids; that saturated glycerids are made up of two entirely different things. No, this line here shown is one component, this is the other and this is the other (indicating).

By Mr. Gifford:

Q. 115. I think it would be well if instead of saying this, and this, you would indicate to which you refer.

A. The base line here is one component, the right oblique line is linolin and the left oblique line is olein. After partial hydrogenation as shown on chart 3 there is brought about a chemical change; we produce another substance; we have added to it. Consequently we have then no longer three components, but we have four components. Those four components are, first, the original saturated glycerids, that is a constant. We have second, the linolin which has been changed; that is a variable. We have third olein which may have been reduced or added to or not; that is a variable, and we have in addition the hardened material, stearin, which is also a variable. Therefore, it would seem to me the more correct way to use this triangular chart to take into consideration those two facts, one that we have a constant and then we have three variables.

I now come to chart 4.

I have here another chart, this one I will call chart No. 4. We make the base line of the original solids present and the right
736 ordinate the added fats because it is the added fats which bring about, or created solid fats, or changes brought about by hydrogenation which changes the material character of the substance. The indicate with the left ordinate the liquid fats. This chart, your Honor, is essentially the same as this one (102) except that it is not the same size.

Now, if under those circumstances we take cottonseed oil, for example, and take the figures that have been given and generally accepted during this proceeding, we have 21½ per cent. of the original solid fats; of course, there is nothing added to it. That comes right on the line (indicating). Suppose we now take the value for L–7. L–7 with 19 per cent., if I remember correctly, added fats, would fall here (indicating).

A. "Crisco" with 4½ per cent. added fats, would fall as indicated on the chart. "Crisco" upper limit with 5.8 added fat, would fall at this point. Exhibit 3, as shown therewith practically 98 per cent. of total fat would fall as indicated. "Kream Krisp" with 6.5 added fat, would fall as indicated, and the curve of the chart is quite different.

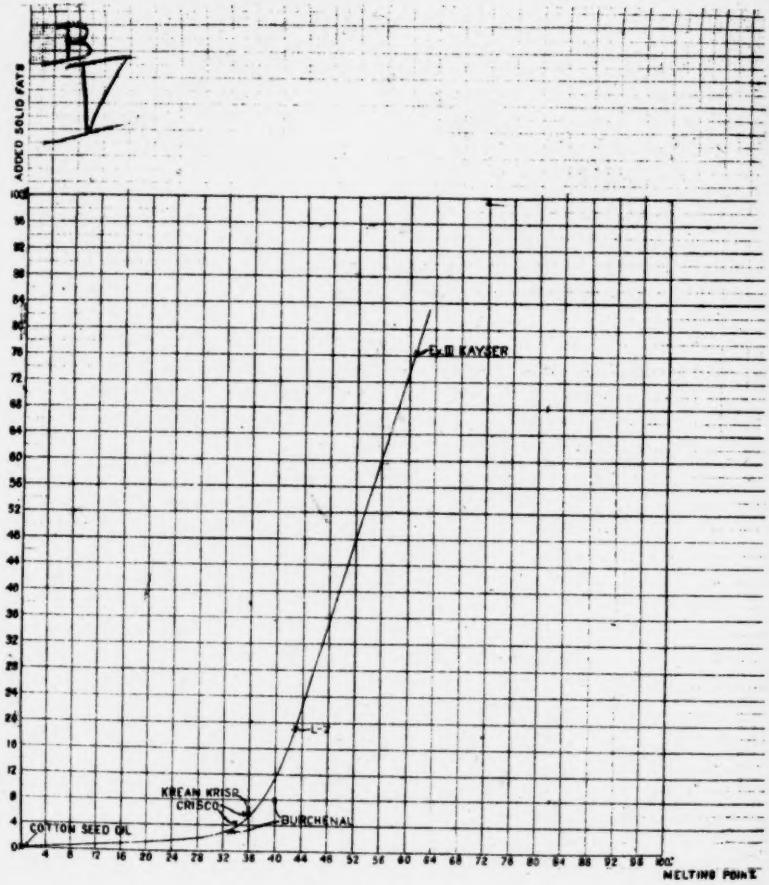
In this chart No. 4 also have been indicated some other points. Those other points are the points that are taken from the Burchenal patent; namely, 17 per cent. solid fat in the original compound, so that changes the base to this point (indicating).

The added fat by the hydrogenation, the lower limit 3, and the point is shown here, the upper limit 8, added fat, is shown here, or, in other words, the arrangement according to the Burchenal patent is practically from 3 to 8 of added fats.

Now, if we shift this base from the 17 to the 21½—how that figure came about, I do not know, but we put it at 21½ —we

(Here follows diagram marked p. 736*a*.)

Berlin Mills Co.
v.
Procter & Gamble Co. } Ex 736a



737 then have it falling absolutely in line with these others. Now, I have stated a few minutes ago, your Honor, that these substances are mixtures. There are in cottonseed oil essentially two things to be considered in the way of composition in connection with these proceedings in my opinionn, and those two are that we have a liuid and we have a solid, and the melting point of the substance is in direct ratio to the solid and the liquid so that with your permission I will put up another chart where we take into consideration the influences of the added fat on the melting point.

I will now call attention to chart No. 5, in which the base line indicates the solid fat present in the original cottonseed oil; namely 21½ per cent.; that is the amount of solid fat present, we will assume, in all the cottonseed oil that we start with. Therefore, we can plot the curve showing the position of cottonseed oil in this chart which is so arranged that the percentage of added fats is indicated on the vertical ordinate. The melting point of the substance is on the horizontal ordinate. Now, the percentage of added fats in cottonseed oil is 0; therefore, it is placed here. The melting point of cottonseed oil is practically 0, so cottonseed oil is shown here (indicating). If we take the melting point of "Crisco" lower limit, to which has been added, as stated a few moments ago, four and one-half per cent. of added fat, we have "Crisco," shown on the chart as indicated (indicating), with 5.8 per cent. of added fat it is shown as indicated here as the upper limit of "Crisco." "Kream Krisp" with 6.5 added fat is indicated on the chart at this point. L-7, which has been submitted with 19 per cent. of added fat is shown on the chart (indicating). Exhibit 3, Kayser, with 76.5 added fat is shown as
738 indicated upon the chart. Then the Burchenal limits are shown on the chart. From that we can derive a curve which you see (indicating).

By the Court:

Q. 116. On what do you base the Burchenal point there in the curve which you plotted out; on the formula, which he gives in the patent?

A. It would be three per cent. added fat; he limits it three to eight per cent. added fats.

Q. 117. Where is that?

A. It is right in here; 17 subtracted from 20. It contains from 20 to 25 per cent. of fully saturated glyceride, and 17 from 20 leaves 3, and 17 from 25 leaves 8.

Q. 118. That is what you think the Burchenal claim means?

A. That is one of the vital things in that, your Honor. The added fats, from 3 to 8 per cent. added fats, that are added by the process of hydrogenation within that unit.

Mr. Gifford: If your Honor please, you say the claim. Of course, the witness is not testifying as to the claim. He is testifying to the figures given in the specification.

The Court: Yes, is that your contention about the claim?

Mr. Gifford: For the purpose of this case that is as broad as it is necessary to make the claim, but whether it would be broader in case of necessity is another question.

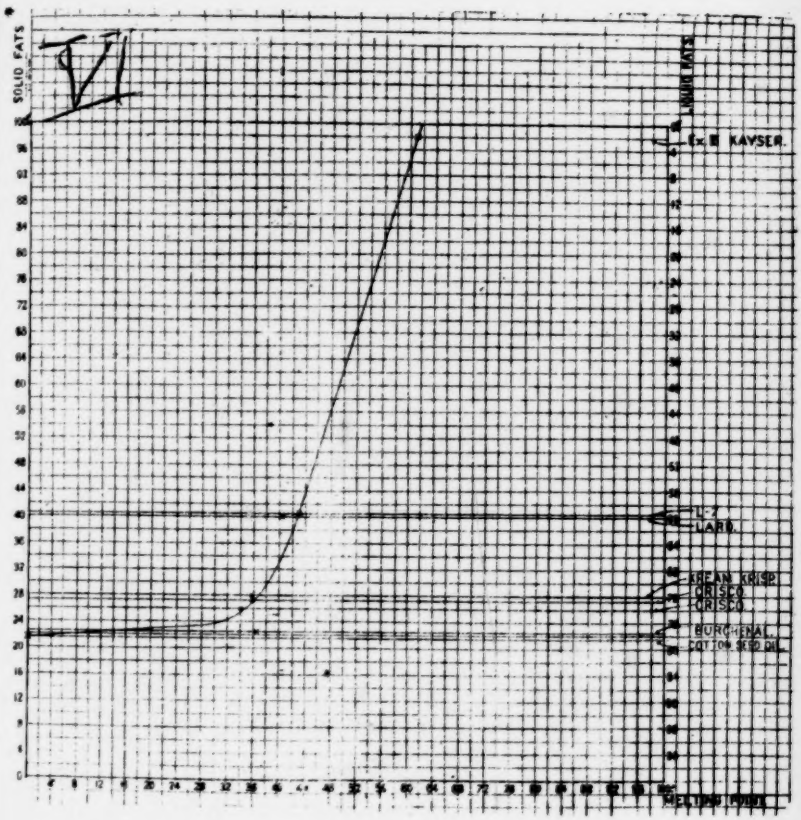
The Court: In other words, the claim as construed in that way is infringed ?

Mr. Gifford: Yes, sir.

(Here follows diagram marked p. 738*a*.)

433

Berlin Mills Co. v. Procter & Gamble Co. } Ex 738a



A. (continued). It is quite conceivable, your Honor, that this curve which is based primarily upon the percentage of added
739 fats, or that which is created within the oil by the process of hydrogenation, may be extended to include the solid fat that is already there.

I have here a chart which I will mark chart No. 6.

In other words, let us take this chart 6, where upon in this rectangular form of presentation we indicate the total solid fats, that is, the solid fats present in the original body and that added, the total solid fat, on the left ordinate going from 0 to 100 per cent. The total liquid fats would, of course, be in reverse order and placed on the right hand ordinate; namely, from 100 up to 0 per cent. If we take any one of these and draw a straight line, or rather a line so that we have 100 per cent. take cottonseed oil at 21½ per cent. solid. Here is our line drawn right across there. If we assumed that that was a box of cottonseed oil and it was possible to separate those two all below that line would be solid and all above that would be liquid, and so let us, in each case of the exhibits that have been put in, and also the reference made in the patent, namely, take "Crisco" lower limit we have this line here which is indicated upon the chart upon the lower limit; we have the upper limit, we have "Kream Krisp," we have Exhibit L-7 and we have the line here showing Exhibit 3. In other words, on the Exhibit 3, that hard body, everything below this line; that is all solid (indicating). Just perhaps two per cent. liquid in there. Everything about this line for the L-7 is liquid and this is solid (indicating). If we indicate the melting points on the chart on the lower line, the base line, it will be observed, it will be carried from 0 to 100, and then indicate the melting points of these different bodies, they will be as shown
740 upon the chart, a curve which is the same curve as that previously developed, but now associated with the entire body of the substance, and when we draw that curve here we observe two very striking things; namely, that the nearer we get to a liquid, the nearer that line becomes horizontal; the nearer we get to a solid, the nearer that line gets vertical, and when it comes down there is a range when there is an abrupt, almost—but a marked change—in character right at this point as shown indicated at L-7, down to "Crisco" lower limits.

Q. 119. It begins the abrupt change about at "Crisco"?

A. Yes. In other words, we go through what some one has designated as a liquid viscous semi-solid, and I think it was said hard, then brittle states.

But the point that I wish to make is that this is a lard area.

The other point there is this, about the figures given in the Burchenal patent. It is given 17 per cent. solid fat. We should therefore have to make a base line at 17 per cent.; it would come across as I will insert here (indicating). The limits will be shown as indicated upon the chart according to the figures given in the patent.

It is quite obvious that with the base changed this is not in that curve there, but we simply change the base, it is the same kind of a

curve; it is a mere matter of having the composition of the origin material.

Now, that is my reason for stating that the triangular coordin chart does not tell us the material characteristics of the substanc involved in this suit.

741 By Mr. Gifford:

Q. 120. Why do you consider the added fats to be the signific and substantial thing?

A. Because the added fat brings about an elevation of the melti point.

Q. 121. And what does the added fat have to do with the lard li qualities of the product?

A. When the proper quantity is there, the substance becomes sem solid and acquires the physical properties of lard.

Q. 122. In your triangular chart marked No. IV, I understand y to take the base of the triangle as representing cottonseed oil unhyd genated, because that has no added fats?

A. Correct.

By the Court:

Q. 123. Where is there anything in this patent about added fat

A. It means added solid fat.

Q. 124. By reason of the hydrogenation?

A. Yes, sir.

Q. 125. It is perfectly clear that there is nothing added to t cottonseed oil in this "Crisco"?

A. Nothing added excepting the hydrogen changing the balan

By Mr. Gifford:

Q. 126. Perhaps it would be more accurate to say "increased fats"

A. Increased solid fats would be more accurate.

Q. 127. So that on chart IV the cottonseed oil is placed at t base line because it has no increased fats in the senses of being i creased by hydrogenization?

A. Increased solid fats.

742 Q. 128. And the increased solid fats indicated by t patent are from three to eight per cent.?

A. Correct.

Q. 129. Therefore, you have indicated on the triangular chart N 4 by the name Burchenal the scope from 3 to 8 of increased solid fa above the cottonseed oil?

A. I have.

Q. 130. And by the crosses connected with the word "Crisco" y have indicated the scope of the increased fats taking the extreme "Crisco" as testified to by Mr. Morrison, as I understand you?

A. That is my understanding.

Q. 131. And by the cross attached to the name "Kream Kris you have indicated the increased fats as given in the testimony of M Richter, being 6.5?

A. I think it was Mr. Richter, yes, the figures that have been given during this hearing.

Q. 132. And this chart No. 4 therefore indicates that "Crisco" and "Kream Krisp" fall within the range of increased fats indicated by the figures of the Burchenal patent?

A. Yes, sir.

Q. 133. And, as I understand you, your chart marked 5 is also on the basis of increased fats and therefore on the same basis as your chart marked 4?

A. Yes, sir; increased solid fats.

Q. 134. And therefore, you have placed cottonseed oil at the base line of chart No. 5 because it has no increased solid fats, not having been hydrogenated at all?

A. Correct.

Q. 135. And you have also placed cottonseed oil at the O point of the base line because you have taken its melting point as O?

A. I have. I would say it is approximately O. It is rather difficult to make the observations accurately under the conditions that we were working, the sample which was used was that which was used in the experiments at Mellan Institute.

743 Q. 136. And this chart, 5, as I understand you, shows that "Crisco" and "Kream Krisp" come within the range indicated by the figures in the Burchenal patent?

A. Yes, sir.

Q. 137. The range of Burchenal being indicated by the crosses to which the name Burchenal is attached, and the range of "Crisco" by the crosses to which the name "Crisco" is attached, and the range of "Kream Krisp" by the cross to which the name "Kream Krisp" is attached?

A. Yes.

Q. 138. The distance in added fats of plaintiff's Exhibit 3 from the range of the Burchenal patent and from "Crisco" and "Kream Krisp" respectively is indicated on charts 4 and 5 by the distance of the cross marked Exhibit III; is that correct?

A. Yes, sir.

Q. 139. The basis upon which your chart 6 was made, as I understand you, differs from the basis on which charts 4 and 5 are made by the fact that instead of being on a basis of increased solid fats, chart 6 is on a basis of total solid fats?

A. The total composition of the oil, of the product obtained by this hydrogenation.

Q. 140. Therefore on chart 6 instead of placing the cottonseed oil at the base line, you place it at a point 21½ which represents the solid fats already present in the unhydrogenized cottonseed oil?

A. Yes, sir.

Q. 141. And the horizontal lines to which the word "Crisco" is attached are placed in the position which represents the increased solid fats plus the solid fats contained in the cottonseed oil from which they were hydrogenized?

A. Yes, sir.

Q. 142. And the horizontal line to which the word "Kream Krisp" is attached, represents the increased solid fats plus the solid

fats contained in the cottonseed oil from which it was hy-
744 drogenized?

A. Yes, sir.

Q. 143. This is upon the assumption that the cottonseed oil from which they were hydrogenized is of a composition of 21½ solid fats?

A. Yes, sir.

Q. 144. And on chart 6 the horizontal line connected with the words "Exhibit 3 Kayser" represents the increased solid fats in Exhibit 3, plus the solid fats in the cottonseed oil from which it was hydrogenized?

A. Yes, sir.

Q. 145. So that each of the horizontal lines indicates the dividing line between the total solid fats contained in the substance whose name is attached to that line and the liquid fats contained in that substance?

A. They do.

Q. 146. And, as I understand you, from a practical standpoint you consider the three charts 4, 5 and 6 which you have prepared, to be on a logical basis?

A. I would say it more of charts 5 and 6. Chart 4 is not as satisfactory to me as charts 5 and 6.

Q. 147. But chart 4 is upon the most logical basis that a triangle chart admits of?

A. If the fact is considered; yes.

Q. 148. And you consider charting the subject on the basis of the increased fats and the total fats to be more logical, than charting the subject on the basis of the percentages of linolin, olein and stearin as in the defendant's chart No. 402?

A. I regard this chart No. 6 as more logical; I can give my reasons for that.

Q. 149. You have already given your reasons, I think.

A. Yes, I will not repeat.

Q. 150. Do you want to give any more reasons?

A. No; I think I have given enough.

Q. 151. As I understood you, from a practical standpoint,
745 the cook using the substance has to do with the consistency of the substance which is attained by the increase of solids due to hydrogenizing?

A. I think so.

Q. 152. And what can you say as to the relative digestibility of fats melting materially above body temperature, and then melting at or below body temperature?

Mr. Pennie: If your Honor please, the witness has not qualified upon this subject.

Mr. Gifford: He was qualified on prima facie.

Mr. Pennie: Not on the question of digestibility of fats.

Mr. Gifford: I thought we put those in in his prima facie case.

The Court: I do not remember just how he qualified, whether he qualified as a food expert or not.

By the Court:

Q. 153. Did you?
A. No, sir; I did not.

Question withdrawn.

By Mr. Gifford:

Q. 154. What qualifications have you on the subject of the digestibility of food products?
A. I have the information acquired as a student and as professor of chemistry. I would like to have it understood when I say student, I do not mean as a young student; I mean as a student all my life.
Q. 155. What can you say as to the relative digestibility of fats melting materially above body temperature and those melting at or below body temperature?
746

Mr. Pennie: I object to the question for the reason that the witness has not qualified.

Objection overruled.

A. The investigators in the Bureau of Home Economics of the United States Government in Washington have published reports on that subject, and I have read some of them.
Q. 156. Have you one of them present?
A. I have.
Q. 157. What is its date?
A. December 15th, 1916.
Q. 158. Does it state anything on the subject, and if so, what?
A. The pamphlet is entitled "Bulletin No. 469, United States Department of Agriculture." The heading of the subject matter contained in the Bulletin is "Fats and their Economical Use In The Home," by A. D. Holmes and H. L. Lang, Scientific Assistants, Office of Home Economics.
On page 4 appears the following, at the bottom of page 4 and at the top of page 5:

"Available evidence indicates that fats such as mutton fats having a melting point higher than the body temperature are less completely assimilated than those melting at a lower temperature, such as lard, butter, olive oil and cottonseed oil. Also it has been shown by feeding experiments with laboratory animals that animal and vegetable stearins (melting above body temperature) are only very slightly assimilated by the body when eaten alone, whereas if mixed with palmitin and olein digestibility is increased because, no
747 doubt, the mixture has a lower melting point than the stearin by itself."

Q. 159. Do you find the following in the 1915 edition of the book of Dr. Lewkowitsch entitled "Chemical Technology and Analysis of Oils, Fats and Waxes," page 1161, Volume 3:

"If the hydrogenation is carried out to too great an extent the fat owing to its melting point would probably be indigestible if used alone (Opp. page 19), and would therefore have to be brought to a softer consistence by admixture with a liquid oil. Since the hydrogenation is also accompanied by the deodorization of the oil and since if the oil is carefully conducted a diminution of the test ensues, it will be possible to harden the oil only to the desired consistence instead of hardening a portion completely to stiffen the bulk of the oil?"

A. I do.

Q. 160. Have you applied the Halphen test to other specimens of "Kream Krisp" besides the one here in evidence and referred to in the stipulation?

A. I have.

Q. 161. With what result?

A. Negative results.

Q. 162. How many specimens of "Kream Krisp" did you apply the Halphen test to, and when were they obtained?

A. I applied the test to one sample received from Mr. T. B. Kerr.

Q. 163. Received from the original package?

A. It was in an original package, but not this package. I received a sample taken from this, that is included here, and a sample I obtained from Portland, Maine.

748 Q. 164. You mean a sample purchased in Portland, Maine?

A. Yes.

Q. 165. And when was that purchased in Portland, Maine?

A. I do not recall the date. Not within the last month, I should say. I would like to have the privilege of verifying the date.

Q. 166. In Dr. Walker's description of the oxydation of alcohol to acetic acid has he omitted any step?

A. In the diagrammatic presentation we usually indicate the aldehyde formation in between the alcohol to the acid. That did not appear in his presentation.

Q. 167. Then as I understand you in going from alcohol to acetic acid the operation goes through the substance aldehyde?

A. We speak of that as the normal procedure. In our instructional work we usually indicate it in that way.

Q. 168. What is aldehyde physiologically?

A. Well, aldehydes are all kinds of bodies, some are foods and some are poisons.

Q. 169. Would this particular aldehyde be a poison or a food, as you understand it?

A. The one in the change from ethyl alcohol to acetic acid would be a poision.

Q. 170. That is the one involved in the reaction that Dr. Walker referred to, was it not?

A. It would be if inserted.

Q. 171. I understand Dr. Bacon to have said that a chemist would have inferred that the Normann patent product was edible from the following statement in the Normann patent:

"Apart from the formation of small quantities of nickel soap, which may be easily decomposed by dilute mineral acids, the reaction passes off without any secondary reaction."

749 Do you agree or disagree with Dr. Bacon in this regard?

A. With that statement alone I would disagree.

Q. 172. With that statement in its context, would you agree or disagree with it?

A. I would disagree. I am doing this in the light of the time when the patent was issued, not in the light of my subsequent knowledge.

Q. 173. Will you give your reasons for disagreeing with Dr. Bacon?

A. In the first place the process of hydrogenation at that time was a very new proposition. Little or nothing was known as to what would take place in the changes when brought about by the addition of hydrogen to unsaturated bodies. In view of that fact, knowing that chemical changes may take place and are very deep seated, without our recognizing them, it would not have been the right conclusion in my mind to draw, or to say that that statement was sufficient to warrant anyone to decide that that was a food product.

Q. 174. Have you read the patents and publications that have been referred to by Dr. Bacon, dated prior to November 10th, 1910?

A. Yes. Does that involve the Sears patent and all patents that were mentioned by Dr. Bacon?

Q. 175. Yes.

A. I have not read all of the patents mentioned by Dr. Bacon. Some patents were mentioned by him that had to do with machinery, and so forth. I have not read those.

Q. 176. Have you read the Normann patent referred to by Dr. Bacon and also the Paal and Roth publications and also the Fokin articles referred to by him in the Journal of the Russian Physical Chemical Society?

A. I have.

Q. 177. Have you also read the Erdmann patent and the

750 Bedford-Williams patent and the Kayser patent?

A. I have.

Q. 178. In all of the patents and printed publications dated prior to November 10th, 1910, or any of them, have you found anywhere any statement or description from which a man skilled in the art would have inferred that a hydrogenized vegetable oil would be edible?

Objected to; overruled; exception.

A. Dr. Bacon found it, apparently, but I should say that it was not conclusive.

Q. 179. The question is whether you have found any?

A. I have not.

The Court: You mean any literature so stating?

Mr. Gifford: I mean whether he found any statement or descrip-

tion from which a chemist or man skilled in the art would have inferred that it was edible.

Q. 180. Dr. Bacon has stated that hydrogenation never makes an edible oil inedible. Was that knowledge communicated by any of the patents or publications dated prior to November 10th, 1910?

A. As I understand it, I think not.

Q. 181. With the hardened product of the prior art before him and a knowledge of the hydrogenation process by which it was produced, would there have been anything in the nature of a hardened product and its process of production which would have repelled the idea of edibility prior to November 10th, 1910?

A. I think so.

Q. 182. What?

A. In the first place, if a product was to be used mainly for two purposes, candles and soaps, and one does not usually asso-
751 ciate foods with a soap factory in his mind, that would have been one reason, although I appreciate we are constantly associating foods with slaughter houses.

Q. 183. And what in the nature of the process of production would have tended to repel the idea of edibility? What I have reference to is the multiplicity of products possible in the process and the uncertainty as to their physiological properties.

Objected to; sustained; question withdrawn.

Q. 184. State what, if anything, that was in the nature of the process of producing the hydrogenated vegetable oil, which would have tended to repel the idea of edibility at least without experiment?

A. It is very difficult to answer that question with our present knowledge so strongly before us. We know now that hydrogenated oils can be used, but at the beginning I cannot but feel that one would have been very unwise and would not have dared to put a food product out that had been treated chemically bringing about those deep seated changes, without having first made some experimentation on its use as a food.

Q. 185. What possible dangers have you in mind?

A. The by-products that might have been produced, the presence of nickel soaps or nickel compounds—the whole field was unknown as to what would take place completely.

Adjourned to Thursday, March 29th, 1917, at ten thirty A. M.

752 New York, March 29th, 1917,—10:30 A. M.

Trial Resumed.

CHARLES BASKERVILLE, resumes the stand.

Direct examination.

By Mr. Gifford:

Q. 186. Can you quote from the hydrogenizing literature statements supporting your opinion that such knowledge of the process as existed would have tended to repel the idea that the product might be edible?

A. In the Normann British patent, No. 1,515, of 1903, there appears on page 2 of the typewritten copy submitted, the following:

"Apart from the formation of small quantities of nickel soap which may be easily decomposed by dilute mineral acids."

That indicates that the product contained something which is not regarded as suitable for food and would require special treatment for the removal of nickel soaps, a treatment with an acid.

In the communication of Paal & Roth, from the article occurring in Berichte der Deutschen Chemischen Gesellschaft, Volume 42, beginning at page 1541, of 1909, there occurs on page 1 of the translation submitted, the following:

"The hydrogenation of the esters of the unsaturated fatty acids, whereby esters of saturated fatty acids were produced, led to a deep-seated change in the properties of the fats, the new products being pulverisable, crystalline masses."

753 On the same page, at the bottom, and at the top of page 2, appears the following:

"In accomplishing this, the remarkable fact was established that not only were the glycerin esters of unsaturated acids hydrogenated but also certain other non-fatty, saponifiable, companion substances which are present to a slight extent in the original fats.

In our last communication we stated that the reduced cod liver oil, with its iodin number 3, no longer showed the characteristic color reactions of this oil which depend on the presence of lipochromes. Similarly observations were made with sesame and with cottonseed oil.

Further down the page appears the following:

"Similarly, the very poison-us croton-oil was converted by hydrogenation into a perfectly non-poison-us tallow."

On page 3 in the same article there appears the following:

"We found again, as mentioned in the former paper that for the complete hydrogenation of all the fats more hydrogen was required

than was theoretically necessary, as indicated by the iodin number of the original fat. In some cases this excess consumption of hydrogen was very considerable. Moreover, we could repeatedly confirm the fact that although more hydrogen had been taken up than was to be expected from the original iodin number, so that one would not have expected any more unsaturated acids to be present,
754 still the hydrogenated fat showed an iodin number, very small to be sure in some cases.

Naturally the simplest way to account for this excess consumption of hydrogen was to assume leakage from the apparatus. This, however, is contradicted by the fact that after a while the volume of hydrogen remained constant which would not be the case if there was any chance of leakage. For this reason, the only way to account for the excess hydrogen is to assume that some other reduction took place, as, for example, the reduction of glycerides of the oxyfatty acids or a reduction cleavage of the glycerids into aldehyde and alcohol."

On page 7 there appears the following:

"As it was of interest to study the physiological action of both the partially and comp'etely hydrogenated oil, two other reduction experiments were performed."

In this connection I wish to state that one would have been in the dark and would not have known what might be present in partially hydrogenized material. It might have been poisonous, it might have been harmless. In fact, evidently Paal was mindful of this, because he took precautions to have physiological experiments made. This is indicated on page 13 of this article of the translation:

"Cotton-seed oil gives the Becchi and Halphen tests which are used in food chemistry for detecting the presence of this oil when
755 used as an adulterant. The cause of the first reaction is the presence of a small quantity of unsaponifiable constituent which has not been characterized further chemically except that it is capable of reducing an alcoholic-etherial solution of silver nitrate to metallic silver. The constituent of cottonseed oil which causes the Halphen reaction (red coloration on heating with a mixture of amyl alcohol and sulfur dissolved in carbon disulfide) is also found in the unsaponifiable part of cottonseed oil."

On page 14 there appears the following:

"Both the hydrogenated products which we obtained from cottonseed oil failed to give either of the above tests. This shows that the unsaponifiable constituents as well as the unsaturated fatty acids, are acted upon by the catalytic reduction, and in this case the effect was permanent, for negative tests were obtained even after the products had stood for ten months."

Even at more recent date, for instance, 1914, the necessity for taking precautions has been recognized. This is clearly stated in the complete specification of the British patent No. 2,307 of 1914, ordinarily called the Badische patent or one of the Badische patents. I

quote from these complete specifications, beginning at line 43 on page 2:

"If such continuous hydrogenation be carried out under a pressure of at least 30 atmospheres, and preferably a pressure of over
756 50 atmospheres, advantages are thereby obtained, because then the reduction takes place not only more rapidly but also at a lower temperature, and this is of great importance because at higher temperatures by-products tend to form and these when present only in small quantities often render the oil or fat useless for soap purposes, such, for instance, as the production of edible fats.

When employing nickel contact agents containing compounds which promote the activity of the nickel reduction can be caused to take place rapidly at a very low temperature, for instance, one of 80 degrees centigrade, or even less, but preferably one not exceeding above 140 degrees centigrade."

Further, in Holde's examination of hydrocarbon oils, translated by Mueller, 1915, on page 299, in the discussion of the physiological synthesis of fats and toxicity in the body, there appears the following:

"Free fatty acids (from butyric acid up, in molecular weight), in so far as they are soluble in water and aldehydes, are poisonous."

And even to-day at this time there is the statement in the United States patent No. 1,209,512 to Joel Starrells, dated December 19th, 1916, entitled "Process for producing fatty acids of high purity and melting point," there appears the following on line 16:

"When a fatty oil such as corn, cottonseed or cocoanut oil and the like is subjected to the action of hydrogen in the presence
757 of a catalyser, such as finely divided nickel, certain bodies of a hydrocarbon nature form presumably by the catalytic reduction of the acid or carboxyl group. These hydrocarbons, especially the partially saturated ones, seemingly tend to discolor at the temperature of the hydrogenation process, forming dye stuff or coloring agents of a brown or black character, which seriously impair the quality of the fatty material from the soapmaker's standpoint."

It would seem to me the effect from a soapmaker's standpoint was that it could only be concluded that it would be objectionable from the standpoint of a food.

In connection with these quotations, recent investigation has shown the influence of minute quantities of things in food. For instance, the investigation on the vitamines, very small quantities of which are able to bring about extensive physiological influence, according to the literature. So it appears to me that Burchenal really made a seedless prune, as you may put it, or spineless cactus. He Burbanked the oils, as you might put it. And by his work he actually made two discoveries: first, that the hydrogenated oil could be put into a compound and used as a food; and, second, that the partially hydrogenated oil itself could be used directly as a food, and thus he founded what is known as the hydrogenized food industry.

Q. 187. Do any of the patents or publications prior to November 10th, 1910, appear to have been in the art of food products at all?
A. No.
Q. 188. From the patents and publications prior to November 10th, 1910, what appears to have been the object and aim of their authors?

758 Objected to.
Overruled. Exception.

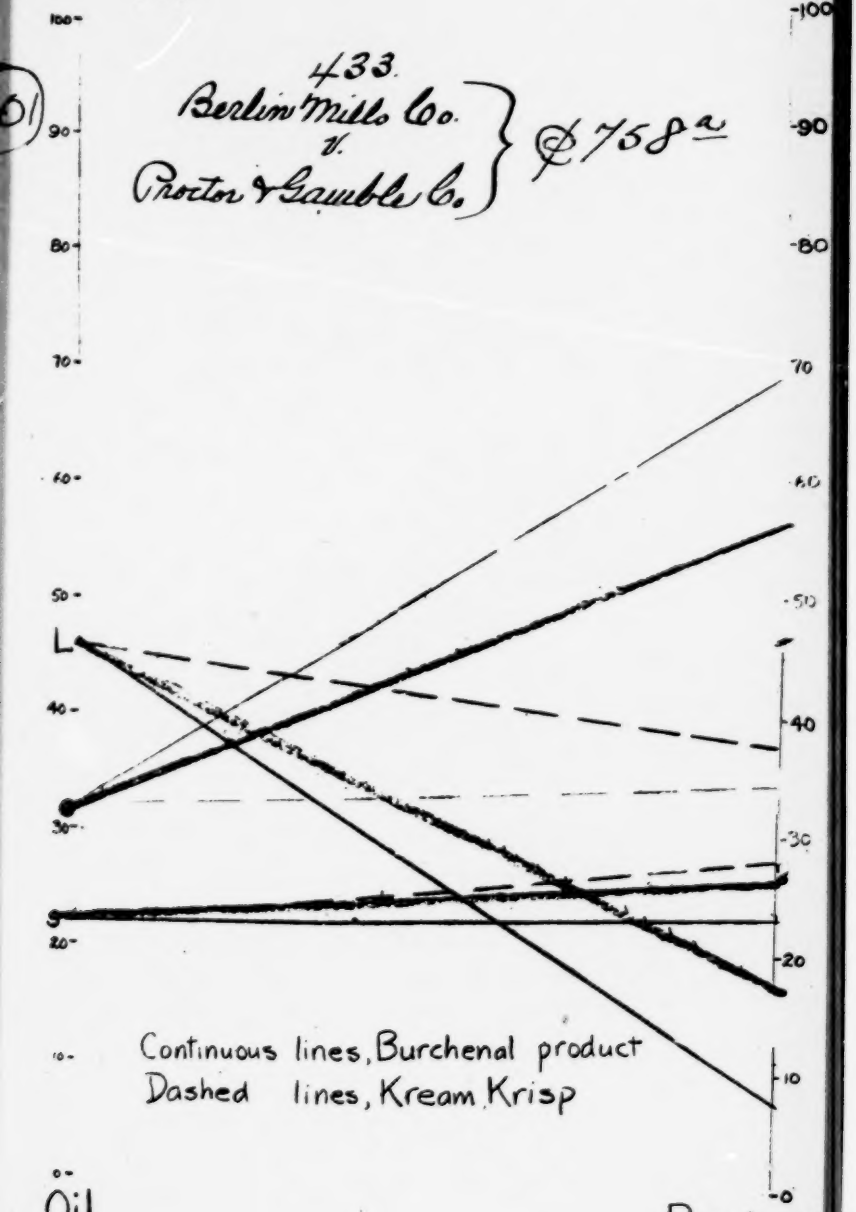
A. The complete saturation. It appeared, reading into the spirit of the publications, that the scientific feat that was to be accomplished was the complete saturation. The idea of partial saturation appears to me to have been incidental.
Q. 189. Was there anything in the teaching of the Kayser patent No. 1,004,035, that would have taught the stopping of the hydrogenizing operation at or about 43 melting point, as the defendant stopped it, in what has been referred to as the L-run represented by the product L-7?
A. No.
Q. 190. Did any of the publications or patents prior to November 10th, 1910, describe or suggest that any degree of hydrogenizing short of approximate completion, or any product thereof, had any utility whatsoever?
A. No.

Mr. May: I object to these various questions as argumentative and improper.
The Court: If they continue, I will sustain your objection.
Mr. May: I just want to say that we do not acquiesce in this kind of examination in any way. We have not attempted to ask such questions of our experts.
Mr. Gifford: You have; but not so many, perhaps.

Q. 191. Have you a photographic copy of the chart 401 referred to in the testimony of the defendant, and if so, have you indicated on that by red lines "Crisco"?
A. I have.

(Here follows diagram marked p. 759*a*.)

433.
Berlin Mills Co.
v.
Procter & Gamble Co.
} ⊄ 758a



Stearine 22%
olein 32%
linolin 46%

(Walker Chart # B)

Q. 192. Will you please explain to his Honor what these
759 red lines in their relationship with the lines already on the chart show?

A. In chart 401, on the left ordinate, is indicated the composition of cotton-seed oil, using round figures. On the right ordinate is indicated the composition of the product. In the case of stearin, which is placed at 22 per cent., the continuous line indicates the Burchenal product according to the specifications which appear.

Q. 193. You mean the specification of the Burchenal patent in suit?

A. In the illustrative statement in the specification.

The dashed lines indicate "Kream Krisp," the red line indicates "Crisco." It will be observed that in all three there is an increase in percentage of what is designated as stearin, but is actually two unsaturated fats combined. That is, the original saturated fat present plus that which is produced by the hydrogenation. That *O* on the left ordinate indicates olein. The continuous black line referred to in the same specification of the Burchenal patent—the dashed line shows "Kream Krisp," the red line, "Crisco." In both instances it will be observed that the percentage of olein has been increased, to a greater extent in "Crisco" than in "Kream Krisp."

At *L*, which designates the linolin, on the left ordinate, present in cottonseed oil, the dashed lines indicate the "Kream Krisp," the continuous line in the Burchenal specification, and the red line the "Crisco." It will be observed that linolin is diminished in amount in the finished product in all three cases. It is diminished to a less extent in "Kream Krisp" than in "Crisco."

Q. 194. In your charts IV and V, is the range indicated by the two crosses to which the name Burchenal is attached, the
760 range of the figures given in the Burchenal patent for the products there exemplified?

A. It is.

Q. 195. You have not undertaken to testify, as I understand you, anything as to the range of the claim of the Burchenal patent?

A. No.

Q. 196. The defendant's process as it has been described here appears to be a continuous process. Was a continuous process of hydrogenization new in the art at the time of the Burchenal patent?

A. No, it was already old. That is indicated in the Erdmann German patent No. 211,669, dated January 10th, 1907, and the patent to Bedford and Williams, the British patent No. 2,520 of 1907, and another British patent to Bedford and Williams, No. 9112 of 1908.

Q. 197. Have you a copy of the last patent referred to?

A. I have. I produce it now.

Mr. Gifford. I will offer in evidence photoslat copy of British patents to Bedford and Williams No. 9,112 of 1908.

Marked Plaintiff's Exhibit No. 15.

Q. 198. Was it new at the time of the Burchenal patent to spray the oil against the catalyst by a jet of hydrogen under pressure?

A. It is mentioned in the Erdmann patent and the Bedford and Williams patent No. 9,112 of 1908.

Q. 199. And in this Erdmann patent was there a relative motion between the catalyst and the hydrogen spray of oil?

A. Yes.

Mr. Gifford: I will offer in evidence the chart No. 401, with red lines added representing "Crisco," which has been identified by the witness.

Marked Plaintiff's Exhibit No. 16.

761 Cross-examination.

By Mr. May:

X Q. 200. In your deposition, Dr. Baskerville, have you used the terms "solid fats" and "saturated fats" as synonymous?

A. I may have at times.

X Q. 201. Would you so use them?

A. Under these circumstances, yes.

X Q. 202. And you would use the term "saturated glycerids" and "solid glycerids" as meaning the same thing in connection with these oils and fats?

A. No.

X Q. 203. Then a solid glycerid might be one that was not fully saturated?

A. It might be.

X Q. 204. You have indicated on several of these charts a certain melting point which you have said was the melting point of "Crisco." Where did you get that?

A. The information was given to me by Mr. Morrison.

X Q. 205. It has not yet appeared of record, has it?

A. I do not think it has.

Mr. Gifford: We will put Mr. Morrison on to prove that.

The Court: Do you dispute that as incorrect?

Mr. May: I do not dispute that as incorrect. If they have stated that the melting point is a certain temperature, I am willing to accept that. I make no point of it.

The Court: I understand it is conceded, provided you are satisfied with your investigation and are willing to state it.

Mr. Gifford: We do state that.

X Q. 206. Just to make it a matter of record, I will ask you, Mr. Baskerville, what is the melting point of "Crisco"?

A. I do not know beyond that statement.

762 X Q. 207. When you speak of these fats congealing at ordinary temperatures, do you mean congealing, say, at 25 degrees C., which is ordinary living room temperature?

A. 25 degrees C. is not ordinary living room temperature.

X Q. 208. What is ordinary living room temperature?

A. I think approximately 21.

X Q. 209. Do you mean then congealing at 21 degrees C.?

A. I presume between 25 and 30 degrees.

X Q. 210. So that when you made reference to fat congealing at ordinary temperatures, you have referred to the temperatures between 25 and 30 degrees C.?

A. Yes.

X Q. 211. You stated at one time, if I understood you correctly, that one of the physical properties of lard is that it is salve like; you still think so, do you?

A. That is when we have indicated it.

X Q. 212. That indicates the consistency of the fat, does it not?

A. Not necessarily.

X Q. 213. But it is one of the ways of indicating the consistency?

A. It is one of the ways.

X Q. 213. You criticised the triangular charts which were referred to by Dr. Walker and by Mr. Richter. If you should assume that a food product consists of three constituents, linolin, olein and stearin, will you have any criticism to make of those charts as indicating the percentages of these component glycerids?

A. Not at all; they are excellent charts.

X Q. 214. So that if you assumed that the charts represented the percentages of the saturated fats and olein and the linolin, they are correct, are they?

A. It is a method of visually presenting figures.

X Q. 215. And disregarding the fact that the saturated fats
763 consist of palmitin and stearin, and grouping them in the term saturated fats, you do not criticise the charts?

A. No.

X Q. 216. You will concede, will you not, that the charts fairly represent the percentages of the component glycerids, saturated fats, olein and linolin of the several oils and fats which are represented thereon?

A. With the qualification in the previous question, namely, that regarding two things as one, I have no criticism to make.

X Q. 217. Have you ever analyzed a refined cottonseed oil which showed the component glycerids to consist of 17 per cent. saturated fats, 37 per cent. linolin and 46 per cent. olein?

A. No.

X Q. 218. Have you ever seen such an analysis except as referred to in the patent in suit?

A. I do not recall.

X Q. 219. Have you ever analysed a refined cottonseed oil, in which the component glycerids consisted of 17 per cent. saturated fats, 46 per cent. linolin and 37 per cent. olein?

A. No.

X Q. 220. Have you ever seen in the prior literature any reference to a fat analyzing those constituents?

A. These percentages?

X Q. 221. Yes.

A. I do not recall it.

X Q. 222. If you were given the iodin value of a cottonseed oil, but were not given the iodin value of the liquid fatty acids would

you be able to state by calculation the proportions of the three component glycerids; namely, saturated fats, olein and linolin?

A. I do not recall any method of being able to do it.

X Q. 223. You concede, Doctor, do you not, that the analysis of the cottonseed oil given in lines 18 to 21 on page 2 of the Burchenal patent in suit to-wit, 17 per cent. saturated fats, 37 per cent.
764 linolin and 46 per cent. olein is fundamentally wrong as to the percentages of the said glycerids with respect to all three?

A. It is wrong.

X Q. 224. Is it recognized among all chemists that ordinary cottonseed oil, contains from 20 to 25 per cent. of saturated glycerides?

A. It varies; it may go from 18 to 25.

X Q. 225. Are you speaking now, Doctor, of Summer cottonseed oil, or are you speaking of an oil from which some of the saturated glycerids have been pressed?

A. The oils vary in different parts of the country, and from different countries. I have been informed that some oils from China run very low in solid constituents.

X Q. 226. How about the oils that are indigenous to this country, cottonseed oil? Is it not generally recognized that the proportions of the saturated glycerids range from 20 to 25 per cent.?

A. I would take that as the average although you have them running as low as 18.

X Q. 227. Since you agree with me on that point, if you started with, and after hydrogenization had 20 per cent. there would be 20 to 25 per cent., and hydrogenized that oil until the final product contained from 20 to 25 per cent. saturated glycerids, would it not be fair to assume that the saturated glycerids had not been increased in the product?

A. If you started with a product 20 per cent. saturated, to begin with, and after hydrogenization had 20 per cent. there would be no increase.

X Q. 228. And the same thing would be true if you started with a cottonseed oil that had 25 per cent saturated glycerids?

A. As the processes are normally carried out.

X Q. 229. Now, Doctor, you have produced cottonseed oil, Plaintiff's Exhibit 4, in which you have the saturated fats comprising 23.3 per cent. of the total oil? What is the minimum amount
765 of saturated fats that you would be required to increase in that oil to stiffen it to a semi-solid consistency; say, of approximately 33 degrees centigrade melting point?

A. I do not know.

X Q. 230. Starting with that oil which has 23.3% saturated glycerids, would the consistency or viscosity of that oil be changed if the proportions of the olein and linolin were reversed?

A. I do not know.

X Q. 231. Are you able to state whether the consistency of that oil would be changed if the saturated fats remained constant at 23.3 per cent., but the linolin should be decreased to 7.5 per cent. and the olein increased to 70.2 per cent.?

A. I do not know.

X Q. 232. You never made any experiments along that line that would enable you to testify in that regard?

A. I do not know what would take place with that oil under those conditions.

X Q. 233. Are you prepared to deny, Doctor, that if cottonseed oil containing 23.3 per cent. stearin, 28.9 per cent. olein, and 47 per cent. linolin, were converted or changed by hydrogenation to a product containing 23.3 per cent. stearin 69.2 per cent. olein and 7.5 per cent. linolin, that the product would not be a semi-solid.

Mr. Gifford: I think the question is objectionable, because it assumes that the product first mentioned could be changed by hydrogenation into the product second named, which I do not understand to be the case.

The Court: I will allow the witness to answer; he can make such explanation as he wishes.

766 A. I am not prepared to make any statement about that.

X Q. 234. In your chart No. VI conceding the analysis of cottonseed oil in the Burchenal patent to be erroneous as you have stated, what justification have you for assuming that in the so-called Burchenal product, the solid or saturated fats have been increased at all?

A. I do not recall having stated that the percentage of solid was erroneous, although I am willing to concede that. The figures that are cited are given simply as illustrations in the patent, as I understand it.

X Q. 235. You have started with an erroneous assumption in your chart No. VI that cottonseed oil has saturated glycerids of 17 per cent.?

A. No, sir.

X Q. 236. You think that is not an erroneous assumption?

A. My assumption there is that it is 21½.

X Q. 237. But you have started with the assumption as 17 per cent. in cottonseed oil, and then you have assumed that if the Burchenal product contains from 20 to 25 per cent. saturated glycerids that he must have increased the saturated glycerids in the product, have you not?

A. Yes.

X Q. 238. So that you started with the assumption that he had an oil originally that contained 17 per cent. saturated glycerids?

A. Yes.

X Q. 239. And you are willing to admit that that assumption is incorrect?

A. I am not; I do not admit that; my assumption is all right.

X Q. 240. Your charts 4 and 5 are also based on the proposition that notwithstanding the erroneous analysis of cottonseed oil in the specification of the patent in suit, that the stearic acid has been increased when the product has a range of 20 to 25 per cent.

767 saturated fats; is not that true?

A. Yes, sir.

X Q. 241. Now, Doctor, in point of fact, if a cottonseed oil like

Plaintiff's Exhibit 4 were converted by hydrogenization to a prod comprising 20 to 25 per cent. saturated fats, 65 to 75 per cent. ol and five to ten per cent. linolin, having a melting point of 33 degre centigrade, would you say that it did not contain sufficient stearin cause it to stiffen or congeal to a semi-solid?

A. I do not know.

X Q. 242. You have stated in your answer to question No. 1 that solid fat is added by hydrogenization to cottonseed oil. What the essential difference in the resulting product so far as making t product semi-solid is concerned whether you increase the solid f by hydrogenation or in some other way; say, for instance, by addi tri-stearin, mechanically, or with your hands?

A. I think the addition of hard stock will raise the melting poin

X Q. 243. So that you could get the same result in either of the two ways?

A. You would get a similar result.

X Q. 244. One would be an equivalent of the other?

A. Not necessarily; very likely.

X Q. 245. The products would be equivalent?

A. In what way?

X Q. 246. So far as the consistency or melting point is con cerned?

A. If they had the same constituents in them, it would.

X Q. 247. Does it make any difference in the consistency of th product whether the solid fat has been increased in the oil by hydr genation or by adding oleo stearin thereto?

A. Very much alike.

X Q. 248. So that, so far as getting a desirable consistency o melting point is concerned in the product, it would not make an difference whether you added your solid fats by a mixer o
768 added them by hydrogenation to it?

A. So far as the melting points are concerned, you ca control it.

X Q. 249. What difference would there be in the products i other respects?

A. It would depend entirely upon the treatment to which it ha been subjected.

X Q. 250. What treatment do you mean, doctor?

A. Tell me what particular products you mean and then I ma be able to answer.

X Q. 251. Say a product which has a melting point of 41 degree centigrade, which has been produced by adding oleo-stearin to cotton seed oil, and another having the same melting point but which wa produced by hydrogenizing the oil; what difference in those tw products would there be?

A. I think there would be a difference that would be determined by the Halphen test but that is not absolutely final.

X Q. 252. What other difference would there be, doctor?

A. Very likely there would be a difference in the content or the ratio of the olein and linolin.

X Q. 253. And if the hydrogenation were carried on by the batch

process you would have a relatively large amount of olein and a relatively small amount of linolin, would you?

A. I have not said so.

X Q. 254. I ask you, would you?

A. I do not know; I think they can be regulated.

X Q. 255. But those two products that I have inquired about would differ from each other in this, would they not, that in the product produced by hydrogenization you would have a greater proportion of olein and linolin, that is to say, you would have a larger amount of olein and a smaller proportion of linolin
769 than you would have in the product which had been produced by adding oleo-stearin to the cottonseed oil?

A. I do not know. I cannot answer that question right offhand.

X Q. 256. In this chart No. VI, I understand the base line represents the melting point?

A. Yes, sir.

X Q. 257. And the ordinate on the left side represents the solid fats?

A. Yes, sir.

X Q. 258. You have indicated on this chart, as I understood you, one point which you have marked Burchenal where you have a melting point of 33 with 20 per cent. solid fats; that is correct?

A. Correct.

X Q. 259. At that same melting point, or approximately that same melting point, say, at 35, you have also indicated another fat which contains 26 per cent. saturated fats. Are those two fats of the same consistency?

A. I have never seen the first one.

X Q. 260. You have indicated them though as having different proportions of saturated glycerids?

A. Yes, sir.

X Q. 261. And yet as having the same melting points, have you not?

A. Yes, sir.

X Q. 262. Have you attempted to indicate on those charts the relative proportion of linolin and olein that are comprised in the liquid glycerids?

A. Which chart are you referring to?

X Q. 263. Any of the three charts which you have indicated?

A. No.

X Q. 264. You have disregarded the relative proportions of the linolin and olein in these fats, have you?

A. I have exercised the same privilege shown in the other case of ignoring two solids and putting them as one. I would like
770 to state, however, that all methods of presentation of this kind do not tell everything. They have some defects, but they do tell us a lot.

X Q. 265. In this particular case in chart No. VI they tell us that in one fat that has a melting point of 33 with 20 per cent. saturated

fats, and another oil having a melting point of 35, that there are 26 per cent. saturated fats?

A. That does.

X Q. 266. Yesterday you gave us a very interesting description of the possible mixed and simple glycerids which may occur in oils and fats, and among them I believe you stated that there would be theoretically in cottonseed oil a mixed glycerid which may be represented by the formula

$$\begin{array}{c} \text{L} \\ \text{G—S} \\ \text{S} \end{array}$$

You have indicated that this possibly may be changed by hydrogenation to a mixed glycerid represented as

$$\begin{array}{c} \text{O} \\ \text{G—S} \\ \text{S} \end{array}$$

That is correct, is it not?

A. On the assumption of its existence.

X Q. 267. You assumed that it existed in making your explanation, did you not?

A. Yes.

X Q. 268. And you assumed that by hydrogenation the linolic acid radical was changed to the oleic acid radical, did you not?

A. Yes; I did.

X Q. 269. That first glycerid that I gave you, which glycerid is termed alpha linola beta gamma di-stearin, is it not?

A. I do not know.

X Q. 270. Do you know whether the second mixed glycerid is termed alpha oleo beta gamma di-stearin?

771 A. Because the first is called alpha linola beta gamma di-stearin, it does not necessarily follow that the second one given would be called alpha oleo beta gamma di-stearin.

X Q. 271. Well, the oleic acid radical is at the top, is it not?

A. As indicated there.

X Q. 272. Do you know whether or not Lewkowitsch gives the melting point of those two mixed glycerids?

A. I do not recall.

X Q. 273. Do you know whether or not the melting point of one of these mixed glycerids is higher than the other?

A. I do not know; I should imag-e that they would be different.

X Q. 274. Would you imagine that there would be a difference of as much as 11 degrees centigrade?

A. I think that is safe.

X Q. 275. If you started with the alpha-linola-beta-gamma-di-stearin and by your hydrogenation you produced alpha-oleo-beta-gamma-di-stearin, would you not have increased the melting point of that mixed glycerid?

A. I should imagine so.

X Q. 276. And that would have been accomplished without the addition of any hydrogen to form a stearic acid radical?

A. Yes.

X Q. 277. So that you might in point of fact get an increase in the melting point of your fat by converting the linolin to olein?

A. Yes.

X Q. 278. And yet in these charts you have assumed that it is secured in every case by an increase in the solid glycerids; have you not?

A. I have lumped the solid glycerids all together.

X Q. 279. Would you be willing to concede, doctor, as a matter of fact, that the melting point of an oil or fat might theoretically, at least, be raised by converting some of the linolin to olein
772 without converting any linolin or olein to stearin?

A. Certainly.

X Q. 280. But, I understood you to say that you had never carried on any investigations to ascertain practically whether this could be accomplished?

A. None; I am just answering on general principles.

X Q. 281. In your deposition yesterday when you said, in effect, that little or nothing was known about hydrogenation at the time of the Normann patent, were you referring only to the hydrogenation of fatty acids or their esters or hydrogenation generally?

A. More particularly to the fatty acids and glycerids, but especially to the glycerids.

X Q. 282. If a fat were presented to you which was new to you how would you have ascertained to what use it might be put technologically?

A. I suppose I would cast around to see the uses that fats were put to.

X Q. 283. What are the chief uses of fats and oils of a vegetable and animal origin?

A. Foods, lubricating purposes, and manufacture of numerous things—the manufacture of glycerine, soap.

X Q. 284. The glycerine, however, is the by-product in the manufacture of soap, is it not?

A. It is the main product in this country at the present time.

X Q. 285. But the great use of oils and fats of animal and vegetable origin is that for food, is it not?

A. That is a great use.

X Q. 286. That is the greatest use, is it not?

A. I think probably it is.

Recess.

X Q. 287. Are you prepared to answer the question that was asked you before recess?

773 A. The time has been so limited, Mr. May, that I have not had a chance to go through the material.

X Q. 288. You were read something through the Bulletin No. 469 of the United States Department of Agriculture entitled, "Fats and Their Economical Use in the Home." Is this the same article that I now hand you?

A. It is.

Mr. May: I offer that in evidence.

Marked Defendant's Exhibit P-2.

X Q. 289. Have you ever seen any cottonseed stearin so-called that has the semi-solid constituents, which were left after chilling cottonseed oil and pressing out the oil?

A. I have.

X Q. 290. At a living room temperature what was the consistency of that cottonseed stearin?

A. It is a semi-solid.

X Q. 291. In cottonseed oil, such for example, as Plaintiff's Exhibit 4, that stearin is present in solution, is it not?

A. What stearin?

X Q. 292. The cottonseed stearin that I referred to that is present in cottonseed oil?

A. I take it that part of it is in solution and part of it is suspended and part of it is in colloidal form.

X Q. 293. You mean in this particular Exhibit 4?

A. I should say so, offhand.

X Q. 294. If that oil were a little warmer it would appear to be clear and colorless, would it not, excepting for the yellow tint?

A. How much warmer?

X Q. 295. Say up to 88 or 90 degrees Farenheit?

A. I do not know. I might explain the reason why this sample is cloudy probably is that it was part of the sample which was used, that it was near the end of the experiment, it very likely had ac-
774 cumulated more than the normal amount of solid material.

X Q. 296. Take ordinary normal cottonseed oil from which the cottonseed stearin has not been expressed, is that cottonseed stearin in solution in the oil?

A. Normally; it is.

X Q. 297. And it has the same melting point whether it is in solution or has been segregated out of the oil?

A. Which has the same melting point?

X Q. 298. The cottonseed stearin?

A. The cottonseed stearin of the same general composition will have approximately the same melting point.

X Q. 299. Whether it is in the oil or has been segregated from the oil?

A. After it is taken out so that you can determine the melting point.

X Q. 300. And when it is in the oil it is in solution at that same temperature?

A. It depends upon the ratio between the two.

X Q. 301. Paal and Roth hydrogenated cod liver oil, butter, lard and oleomargerine. These are all recognized primarily as food fats?

A. They are.

Redirect examination.

By Mr. Gifford:

R. D. Q. 302. What is the solidification temperature of linolin and olein respectively?

A. I do not know the solidification point of either one. If I remember correctly, that of olein is below—I can give it of olein, but I have not it of linolin—they are below O anyhow.

R. D. Q. 303. Neither or them congeals?

A. At any ordinary temperature they are both liquids.

R. D. Q. 304. And the melting points are both somewhere about O or below, I suppose?

A. Yes; quite so.

775 R. D. Q. 305. In making the compounds a greater percentage of the hardened product is added to the oil to produce a given consistency than appears to be added when it is done in the hydrogenizing process; is that your understanding?

Mr. May: I object to the question as leading.

Objection overruled.

A. In making the compounds there is added to it quite hard fat. In making the hydrogenated product the hard product is created from constituents already present in the oil. If you take a compound which has 90 per cent. of cottonseed oil and 10 per cent. of very hard product, there will be added to it more of the hard fat than is shown to be produced in any of the partially hydrogenized products of lard-like consistency which have been presented to my attention during this controversy.

R. D. Q. 306. Mr. May has called to your attention the possible formation of various tri-glycerids in distinguishing which he has used the alpha beta and gamma, I think. Assuming that such glycerids exist, how many bodies would there be intermediate between the linolin and olein?

A. I am unable to say.

R. D. Q. 307. A host of bodies?

A. A great many.

R. D. Q. 308. And also another host between olein and stearin or palmitin?

A. Possibly.

R. D. Q. 309. Will you please state why you chose stearin as the basis of your charts IV, V and VI?

A. In chart IV, the basis there is the added or a better word is the penerated or produced stearin. In chart V it is the same. In chart VI it includes these generated or produced solid constituents of these bodies. This is regarded primarily as stearin and

776 the reasons for making that as the basis or the base, are several; first, it is the specific substance that is mentioned in the Burchenal patent to bring about congealing. That is shown at lines 72 to 74 of the Burchenal patent, page 1, and on page 2, lines 24 to

26, inclusive, and I will read into my answer the data referred to. In the first reference it is:

"And with only sufficient stearin to make the product congeal at ordinary temperatures."

The second quotation is:

"And with only enough stearin to make the product congeal at ordinary temperatures."

The second reason for adopting stearin as our basis in these comparisons is that it is known to be the factor which is involved in making lard compounds out of these hydrogenized products as well as with the addition of stearin. And the third reason, it is quite evident that what we obtained, the results have shown, is in accord with the known facts. The fourth reason is that olein and linolin are liquids, they are liquids through a wide range of temperatures, and we are considering here substances at the ordinary temperatures. That is the reason why we have selected it as our basis for the charts as presented.

R. D. Q. 310. You say that this selection results in showing in accordance with known facts. What known facts have you reference to?

A. The facts as to the total solids, and the melting points, which facts are associated with the consistency of the products under consideration.

777 R. D. Q. 311. Bringing together those products of corresponding consistency?

A. And in addition to that, it is apparent on the chart that those products are brought very close together. In the case of the triangular chart the products appear very widely separated and from observation of the material it is apparent that in their consistency they are very close together.

R. D. Q. 312. Were you referring in the latter part of your answer by triangular chart to that of your own or of the defendant's?

A. The defendant's.

R. D. Q. 313. Do you know what specimens of Chinese cottonseed oil sometimes contains in saturated components?

A. My recollection is they will have as little as ten per cent., but I would like to verify that if there is any question raised.

R. D. Q. 314. If a cottonseed oil be taken with a consistency of 18 per cent, such as I think you said was sometimes natural to this country, might the percentage of saturated constituents be reduced by chilling and squeezing out, as you understand it?

A. I doubt it.

R. D. Q. 315. You do not know?

A. I do not know. I should state limiting that chilling, chilling as is ordinarily done in what is known as the cold pressing of the cottonseed oil.

Recross examination.

By Mr. May:

R. X Q. 316. Dr. Baskerville, you do not mean to take the position, do you, that oleins and linolins have the same solidification points?

A. No.

R. X Q. 317. The solidification point of linolin is very much lower than that of olein, is it not?

A. I do not know the solidification point of linolin.

R. X Q. 318. Do you know the solidification point of 778 olein?

A. If you will allow me to refer to my notes, I will probably be able to give you that figure.

R. X Q. 319. Perhaps I can help you; is it not minus four degrees centigrade?

A. That is correct.

R. X Q. 320. Does linolin remain liquid below minus 16 degrees centigrade?

A. I do not recall the melting point or the congealing point of linolin.

R. X Q. 321. You made reference to the patent and called attention to the fact that the patentee used the word "stearin." Do you find in the patent anywhere specific reference to the exact amount of stearin which he prefers to use?

A. No.

R. X Q. 322. Let me call your attention to claim 7. Do you find there that that food product is described as having 23 per cent. stearin?

A. Yes, sir.

R. X Q. 323. When did you first learn, Doctor, that Chinese cottonseed oil may have only ten per cent. saturated fats?

A. I do not know when I first learned it.

R. X Q. 324. Do you ever remember having read that anywhere?

A. I think I have but I cannot give you the reference.

R. X Q. 325. Or were you told that?

A. I have been told it also.

R. X Q. 326. You were told it when?

A. I cannot name the date, within the last month.

R. X Q. 327. Were you told it to-day?

A. I do not think so.

R. X Q. 328. Did not Mr. Burchenal tell you to-day?

A. Not that I recall.

779 HARLEY J. MORRISON, recalled in rebuttal, testifies as follows:

Direct examination.

By Mr. Gifford:

Q. 43. Mr. Morrison, what chemical education and practice have you had in general and particularly in relation to food products of the kind under consideration?

A. I am a graduate in chemistry at the Sheffield Scientific School at Yale University, and have been connected with the Procter & Gamble Company, having charge of their development to a large extent and their cotton oil refining through a number of years, and afterwards with the hydrogenation of fats and deodorization, etc.

Q. 44. Have you had to do with the practical chemistry of the compounds of cottonseed oil and also the partially hydrogenized cottonseed oil?

A. Yes; I have given them a great deal of study and I have instituted many experiments along that line in our laboratories of which I am head.

Q. 45. How long have you been in the chemical laboratory or at the head of the chemical laboratory of Procter & Gamble?

A. Since 1910 I became the head; I have forgotten just the date, along about that time.

Q. 46. Do you know who made the two specimens that were marked for identification as Exhibits B and C?

A. Yes, sir.

Q. 47. Who made them?

A. They were done under my direction by a chemist named Mr. Snoddy.

Q. 48. Describe how they were made?

A. These were made in the laboratory. Referring to Exhibit B for identification we first put into the small laboratory hydrogenator 50 grams of oil with 7½ grams of a catalyser. This catalyser
780 was made in our regular manner and was the same as our commercial; in fact, it was taken from a portion of the commercial catalyser that we use. This was allowed to run for ten minutes with hydrogen passing through it at a temperature of 175 degrees centigrade. We then added to that 100 grams of cottonseed oil, and ran the whole, that is, the 150 grams, for two minutes. This was then taken out and after filtering out the catalyser the constants were determined and we obtained these figures:

Iodin value 86.6. Liquid iodin value 128.7. Halphen test, absent. Solid fats 29.5. Oleic, 40.7. And linolic 29.8.

Referring to Exhibit C for identification, this was carried out in practically the same manner, except that after adding the 100 grams of oil the whole was only run for one minute in place of the two minutes that the previous experiment was run, and this gave an iodin value of 89.2; liquid iodin value of 136.2; Halphen test, absent; solid fats 31.4; oleic 34.1 and linolic 34.5.

Mr. Gifford: I now ask that these be marked in evidence.

Marked Plaintiff's Exhibits B and C.

Mr. May: If your Honor please, I object to the admissibility of this evidence relating to these matters of these exhibits. We had no opportunity to see them performed; we knew nothing about them; they were made without advising us that they were to be made; they have been presented here without an opportunity for us to know anything about them.

The Court: What is there about them that you disapprove of or distrust?

781 Mr. May: I can bring that out on cross examination.

Q. 49. Have you ever applied the Halphen test to a specimen of "Kream Krisp"?

A. Quite a number.

Q. 50. How many?

A. A dozen or so.

Q. 51. What did you find with respect to "Kream Krisp" responding to the Halphen test or not?

A. The Halphen test was absent in the majority; a few responded.

Q. 52. In those cases that responded to the Halphen test was the response faint or intense?

A. It was only a pink color.

Q. 53. What, in your opinion, did that indicate?

A. Comparing that with a fat to which a known quantity of cottonseed oil had been added it indicated that there was only one or two per cent. at the outside present in those samples of "Kream Krisp."

Q. 54. Will you state the melting point of "Crisco," of the range that you gave in your former reposition?

A. The deposition that I gave here in prima facie, you mean?

Q. 55. Yes.

A. They will range approximately from 34 to 36. That is, as I understand it, those having solids about 26 to 27.3, as we determined it.

Q. 56. Those having solids of 26 per cent. melt at 34 and those having solids of 27.3 melt at 36?

A. Approximately.

Q. 57. Were you acquainted with the knowledge existing in Procter & Gamble's factory at the time that the patent in suit was pending or at the time the application for the patent in suit was pending?

A. Since 1910, I understand your question.

Q. 58. It was pending from November 10th, 1910, to April

782 13th, 1915.

A. I have knowledge of it, yes, sir.

Q. 59. Is it your opinion that an hydrogenized cottonseed oil, having a greater percentage of linolin, is more susceptible to oxidation than one having a smaller percentage?

A. Yes, sir.

Q. 60. What, at the time this application for patent was pending, was understood to be the effect of the solids and liquids respectively upon the qualities of a product as a shortening?

A. We regard the content of a solid when saturated as having little or no value as a shortener from experiments of our own at previous date, and also from literature.

Q. 61. The patent says:

"Saturated fats, however, serve the purpose of congealing the shortening within the food and thus retain it equally distributed throughout the whole."

Was that your opinion at that time?

A. Yes, sir.

Q. 62. Is it still your opinion?

A. It is.

Q. 63. And the patent also says that:

"Oil liquid at the ordinary temperatures, does not make the best shortening because the oil remains liquid, keeping the food in a soggy condition, and the oil will even settle to the under part of the cooked product and soil the cloth, paper or whatever it may come in contact with."

Was that your opinion at the time the application was pending?

A. It was.

Q. 64. And it is still your opinion?

A. It is still my opinion.

783 Q. 65. What was your opinion at that time with respect to the effect of solids on digestion, and what is still your opinion?

A. That solids, the hard fats, are not as digestible as the liquid fats. That was my opinion, and I have not seen anything to controvert it.

Q. 66. The patent says that the "white or yellowish semi-solid more closely resembles lard than do the commercial mixtures of cottonseed oil and animal oleo-stearin." Was that your opinion at that time?

A. It was, sir.

Q. 67. Upon what was it based?

A. That in hydrogenation there is a bleaching effect that goes on at the same time, and with the best methods of bleaching cottonseed oil, we cannot approach that color, so that we get a better color by hydrogenation than we do by the use of Fuller's Earth which we have to use for making compounds.

Q. 68. The patent also says that:

"In many respects the product is superior to the leaf lard as a shortening."

Was that your opinion at the time?

Mr. Pennie: It seems to me the witness has not been qualified to answer this and similar questions that have been asked him. It is incompetent.

Mr. Gifford: I am merely showing that the statements of the patent are in accord with what they understood to be the fact.

The Court: I will allow his testimony.

A. It was.

Q. 69. And the patent also says:

784 "It is not so liable to become rancid and the product can be heated to a considerably higher temperature than lard without smoking or burning."

Did that represent your opinion at the time?

A. It did.

Q. 70. How did you determine the fact that the product could be raised to a higher temperature without smoking or burning?

A. We conducted laboratory experiments on identical lines, using a light of constant intensity and taking other precautions.

Q. 71. What percentages of saturated fats do you understand cottonseed oil to contain?

A. On the average in the neighborhood of 20 or 21 per cent. They vary considerably above and below that.

Q. 72. How much below?

A. I have seen cotton-oil indigenous to this country as low as 18.

Q. 73. Have you seen cotton oils from foreign countries still lower?

A. The Chinese oil, of which we have handled quite a large quantity, goes very considerably below that.

Q. 74. How much below it?

A. I think as low as ten or 12 per cent. They will only have a titer of 28 to 29 as compared to 34, 35 and 36 for American oils.

Q. 75. And if a cottonseed oil of say 18 per cent. saturated fats be subjected to the chilling and pressing process, what can you say as to whether they are reduced or not?

A. If they are chilled, why, some stearin will drop out and that can be removed by filtration.

Q. 76. In your opinion are there any glycerids existing in partially hydrogenized cottonseed oil which do not exist in the cottonseed oil from which it is hydrogenized?

A. Most decidedly.

785 Q. 77. Can you mention some of them?

A. I have not isolated them, but just from the fact that there is considerably more stearin or stearic acid formed, I know that there must be glycerids present somewhere that are not present in the original oil. Also there are other changes which in my opinion must take place.

Q 78. You are familiar, are you not, with the manufacture by Procter & Gamble of the compounds of cottonseed oil and oleo-stearin?

A. We are not manufacturing any from oleo-stearin now. We did have at one time some, and I was familiar with them at that time.

Q. 79. And you were also familiar with the manufacture of the

compounds from cottonseed oil and hard hydrogenized cottonseed oil?

A. Yes, sir.

Q. 80. In making those compounds, what percentage of the hard substance is added to the oil in general?

A. If we made a product as hard as this Plaintiff's Exhibit No. 7 we probably would not add more than 7½ to 8 per cent. But ordinarily we do not get it as hard as this sample. We usually have it at a melting point of about 55 or 56, and in that case we add from nine to ten per cent. It varies somewhat with the summer and winter seasons. We make it a bit harder in the summer and softer in the winter time. And also for the product that is going to the North and the South—that is, our Macon factory usually adds more than we do at Cincinnati.

Q. 81. Where hydrogenized cottonseed oil is used in the manufacture of soap, it is chemically treated before it becomes useful as soap, is it not?

A. No, sir.

Q. 82. I thought it was saponified?

A. Not saponified for soap.

786 Q. 83. I mean it is chemically treated to make soap?

A. It is a chemical reaction to make soap; yes, sir.

Q. 84. But neither in the compound nor in the "Crisco," as I understand you, does it receive any chemical treatment to produce the food product after hydrogen*i*zation?

A. No, there is no reaction. There is no chemical reaction. We use mechanical means.

Cross-examination.

By Mr. May:

X Q. 85. You were asked as to your opinion as to certain matters in this patent at the time when it was pending in the Patent Office. When this application was filed, was it your opinion that the preferred melting point of the product was 41 and 42 degrees C.?

A. No, sir; not when the application was made. I did not make up that application.

X Q. 86. You did not make this up?

A. No, I did not make it up.

X Q. 87. That was given as the preferred melting point of the product when the application was filed, was it not?

A. I believe it was. That is my understanding.

X Q. 88. Whoever put that in must have changed his opinion afterwards, must he not?

A. He probably did.

X Q. 89. That probably was the reason why the melting point range was dropped 3 degrees Centigrade, was it not?

A. Yes, sir.

X Q. 90. Mr. Morrison, those two samples, Defendant's Exhibits

B and C, I will refer to now. Did you ever commercially produce any product like that Defendant's Exhibit B?

A. No, sir.

787 X Q. 91. Did you ever commercially practice the process which you practiced in producing that?

A. No, sir.

X Q. 92. As I understand you, you started with 50 grams of cottonseed oil and you hydrogenized ten minutes with catalyst which bore the ratio of 7½ grams of catalyser to 50 grams of oil; that is correct?

A. Yes, sir.

X Q. 93. What was the ratio of the nickel to the oil by weight?

A. That catalyser contained ten per cent. of nickel, so that would be .75 of nickel to 50 grams of oil.

X Q. 94. That would be about 1½ per cent. the weight of nickel?

A. Yes, sir.

X Q. 95. Why did you stop the process when you ran it ten minutes?

A. Because at that point we were assuming that it would have formed a certain amount of hard material and would have increased the saturated parts to a certain figure, which we were aiming at.

X Q. 96. You did not analyze the material when it reached that stage of hydrogenation?

A. No, we did not.

X Q. 97. You did not do that to determine the proportion of the component glycerids?

A. No, we did not.

X Q. 98. Then you added 100 grams of oil?

A. We did.

X Q. 99. Why did you run it two minutes thereafter?

A. To give the whole a partial hydrogenation and to have that 100 grams undergo a certain amount of hydrogenation.

X Q. 100. Why? To try to destroy the Halphen test?

A. The Halphen test and to bring it to certain constants, which we obtained.

X Q. 101. But your main object was to destroy the Hal-

788 phen test, was it not?

A. I do not think so. I knew that it would do that.

X Q. 102. Did you think up this scheme yourself?

A. No, sir.

X Q. 103. Really you produced a compound, did you not?

A. I do not think so. Compounds are not made in that way, and that is not what we regard as a compound.

X Q. 104. What was the apparatus that you used, Mr. Morrison?

A. A laboratory apparatus, brass beaker with a stirring apparatus in it.

X Q. 105. And you bubbled the hydrogen through it?

A. We bubbled the hydrogen through that, yes, sir.

X Q. 106. Did you have an agitator in it?

A. Yes, sir.

X Q. 107. Did the agitator move through the overlying body of hydrogen gas?

A. No, this was a vertical machine.

X Q. 108. You did not use a Kayser apparatus in making it then?

A. No, sir, not as the Kayser apparatus is described in the patents.

X Q. 109. Defendant's Exhibit C—take that. You started with 50 grams of oil, you say?

A. Yes, sir.

X Q. 110. And you ran in ten minutes and you added 100 grams of oil and ran it one minute. Why did you run it one minute?

A. To get the certain constants in the finished product.

X Q. 111. Would you not have had substantially the same constants if you had not hydrogenized that compound for that one minute?

A. Those were both carried on in practically the same way, with the exception that Defendant's Exhibit B was run two minutes and Defendant's Exhibit C was run one minute, and we have different constants in each.

789 X Q. 112. Yes, but my question was if you had not subjected these materials to the second hydrogenation operation would they not have had substantially the same proportions of component glycerids that they have now?

A. Certainly not. These constants that we have got now show there is a difference in running it one minute and running two minutes. It is quite obvious.

X Q. 113. In other words, there would be the same difference as you have in Defendant's B and Defendant's Exhibit C at the present time?

A. That is the probability.

X Q. 114. Suppose you had subjected that 100 grams of oil to the action of the hydrogen for only one minute, would you not have found in the resultant product substantially the same percentages of component glycerids as you would have found in the oil originally?

A. No.

X Q. 115. There would not have been any material change?

A. How much do you call substantial? It would have started. It goes down. The iodin number begins to drop pretty rapidly; the first minute in hydrogenation is a greater drop in the iodin number showing the procedure of the hydrogenation, than the fifteenth minute or the thirtieth minute.

X Q. 116. How much of a change would there have been in the percentage of olein, say?

A. I cannot answer to that.

X Q. 117. Really, the purpose of running that 100 grams of oil through the hydrogen for one minute was to destroy the Halphen test, was it not?

A. No, sir. I said a while ago that that was not our intention.

X Q. 118. If you had run the hydrogen through that 100 grams of oil for one minute the oil would have still been a liquid

790 would it not?

A. Without the other, you mean?

X Q. 119. Yes.

A. I think it possibly might have at the ordinary temperatures you are speaking of.

X Q. 120. I will read you a paragraph from a bulletin of the United States Department of Agriculture, No. 77, entitled, "Olive Oil and Its Substitutes," by L. M. Tolman and L. S. Munson, prepared under the direction of W. D. Bigelow, Chief of Food Laboratory, for the year 1905, which is as follows:

"Cotton-seed oil is the chief adulterant of and substitute for olive oil in this country. It is used to a large extent under the name of salad oil but is also frequently sold as olive oil, with which it is extensively mixed. The well refined oil has a pleasant though characteristic taste and odor, and is much less inclined to become rancid than are olive oil and other oils used for salad purposes. The cotton-seed oil sold for salads is refined in part by the use of alaklis and this treatment removes all the free fatty acids. The samples of cotton-seed oil found upon the market all show very small percentages of free fatty acids, due to the above treatment and to the tendency of this oil to remain stable."

Is it your opinion cotton-seed oil is a stable oil?

A. No, sir; it is known as a semi-drying oil.

X Q. 121. Is it your opinion that it is a stable oil as regards rancidity if the free fatty acids had been removed?

A. No, sir.

X Q. 122. You made some reference to smoking point in your direct examination. Does lard compound smoke at a higher
791 or a lower temperature than "Crisco"?

A. A lower temperature.

Redirect examination.

By Mr. Gifford:

R. D. Q. 123. Do you know of any hydrogenation process producing a semi-solid product than by changing the olein and linolin without increasing the saturated fats?

A. I do not.

R. D. Q. 124. In producing a substance of corresponding consistency by partial hydrogenization and by mixing as in the making of the compound, which adds the greater percentage of solid fats?

A. In the final analysis they are practically the same. In the compounds we add a given amount to the oil, whereas in the hydrogenated products like "Kream Krisp" and "Crisco" we increase the solids at the expense of the liquid. So that in the ultimate analysis, however, the ratio between the solids and the liquids is pretty nearly the same.

R. D. Q. 125. But when it is done by the hydrogenating process does the process increase the percentage of saturated fats to the same extent that they are increased by the addition of them in making the compound?

A. Possibly not quite, but it is very close to the same figures.

R. D. Q. 126. In the making of "Crisco" what do you figure to be the addition of the solid fats by the hydrogenization?

A. As I have not figured it here, from the figures given in the Burchenal patent, and so forth, from 3 to 8 per cent.

R. D. Q. 127. And in the making of the compounds how much of the solid fat is added to the cotton-seed oil?

A. Why, I testified if it were a very hard fat like this Plaintiff's Exhibit No. 3, it would be somewhere in the neighborhood of 7½ or 8 per cent., whereas, if it is not quite saturated, with a 56 melting point, we would have more—8 or 9 or 10.

792

R. D. Q. 128. So that the solid fats added in making the compound would be from 7 per cent. up to what per cent. in practice?

A. Up to ten per cent.

EMMA HANKO, a witness called by the plaintiff in rebuttal, being duly sworn, testified as follows:

Direct examination.

By Mr. Allen:

Q. 1. Your residence, Miss Hanko?

A. I reside in New York.

Q. 2. How old are you?

A. I am 34 years old.

Q. 3. What is your occupation?

A. I am a lecturer and demonstrator.

Q. 4. On what subject?

A. I am employed by the Forecast Magazine as Director of their Modern School of Cookery, giving lectures and demonstrations to the housewives and students of the different schools in New York City.

Q. 5. And to what interest is the Forecast Magazine devoted?

A. The Forecast Magazine makes a business of taking up the food question.

Q. 6. What has been your education and training in domestic science in connection with cooking?

A. I am a graduate of Pratt Institute; and anyhow I cannot remember really when I was not interested in the subject of foods. I studied the food question ever since 1900, that is, by myself, and I have also taken up the food question in as great detail as Pratt Institute would give it to us. We had really a very thorough course there, and since that time I have been on the platform giving

793

actual demonstrations and lectures for, I might say, at least 48 or 50 weeks of the year.

Q. 7. I wish you would please explain to us, Miss Hanko, the uses of a shortening in cooking?

A. As we ordinarily think of the shortening in cooking, we think of it perhaps in connection with the flour mixture. If you put shortening in a flour mixture it gives us what we call richness and

richness in this sense has to do with what we call a texture and quality rather than a food value. Of course, we get a food value as well as we do the quality and texture.

Q. 8. If you did not have the shortening present in the mixture, what would the batter be like?

A. Well, I think the batter might be very much like a ball of dough—that is, a mixture like paste.

Q. 9. You need the shortening to give it a richness and crispness; is that right?

A. Yes, it is a quality and texture that we get by adding shortening.

Q. 10. In the ordinary cooking what causes the raising up and the puffing up of the batter or mixture when it is being cooked?

A. Well, it may be caused by different things. Some times we add baking powder and yeast to the mixtures and they furnish a gas which would puff up the mixture. Very many times we add water and as we expect the steam which will come out of the water will help to leaven the batter and puff it up and also sometimes by the heating of the batter we incorporate air, and air with the influence that heat has on it, expands, and will do the same thing these other mixtures do. So, we look to three sources.

Q. 11. In the absence of the baking powder and yeast, as I understand it, then it is the steam from the water or the milk, that
794 is generated in the cooking that causes the puffing of the batch?

A. I should say, yes.

Q. 12. What would you say was the difference between the use of a cooking oil and cooking fat such as lard or lard substitutes, as they are used in ordinary cooking?

A. As we think of those in flour mixture work, especially in connection, we will say, with pastry work, a good bit of shortening is put in, and we find that if we use an oil we have to use something else. We use very much less oil, because if you put oil into the batter, you will find that the oil alone with the flour will make a batter—that is, it will make a sort of batter. But you have to leave out some of the oil in order to get the water. So you will find that you would just use about half as much water to get that into a dough as you would if you had used a fat.

Q. 13. And the effect of the use of only half the water is what?

A. It means that you cut down your water fifty per cent. and you get fifty per cent. less steam, and you get a paste which looks as if it were made of hot water, and not puffed up and flakey, as if you had fat.

Q. 14. Because, with the use of the oil, you have not enough water present to make the steam?

A. Yes, sir.

Q. 15. How about hard fats in cooking?

A. If the fat is too hard, it is hard to scoop up and get out of dishes that it might be in, and it is hard, too, to manipulate fat in such a way that you would have a perfect combination of fat with the flour.

Q. 16. What is the result of the use of the hard fats in frying?

A. Well, if you use the hard fat in frying you get a crust of fa
Taking this out, it would get solid very quickly, and you woul
have a crust of fat outside your doughnut.

795 Q. 17. It would be covered with a white deposit?

A. You might not see it covered with a white deposit, bu
you would have more fat than you would if you had used a soft
fat.

Q. 18. What have you to say about the difference between th
hard fats and the ordinary lard substitutes as far as digestion goe

A. Well, I feel that we give the preference to the soft fats on a
count of their melting point.

Q. 19. Why does that affect digestion?

A. The soft fat put into the body would naturally melt at th
body temperature, and it is natural to assume that if the body is no
mal and has the digestive juices which would attack a fat, if the fa
is all melted it could all be reached and digested in the normal bod
But if the fat went into the body in any appreciable amount an
were not melted it could not digest it, or at least it would be ver
slow in digesting it. We should say it was very difficult to diges
that fat. It might digest it perfectly in the end, but it would tak
a longer time and be more of a tax on the body than a softer fat.

By the Court:

Q. 20. How about a hard fat if it is ground up into very fine pa
ticles, before it is put into the dough—powdered practically?

A. Of course, that would facilitate putting it into a batter.

Q. 21. You do not think it would make any difference in th
matter of the digestion, that it would be just as indigestible a
though it were hard fat that was reduced somewhat by melting?

A. I feel that if the fat were still left in the form of Plaintiff
Exhibit 3, while, of course, we never get as large a piece a

796 that, that there is some of that that could be attacked by th
digestive juices, but any that is on the inside could never b
digested, because it never could be melted in the body. If it had
melting temperature of 60 degrees, it could never be melted in th
body.

By Mr. Allen:

Q. 22. This product in this bottle marked Defendant's K-2 is
powdered mixture of a very hard fat and flour. What would be th
effect of having that in ordinary cooking as a cooking fat?

A. That has the same consistency and the same appearance tha
flour has and would be very easy, I imagine, to put into a flour mix
ture. You might more easily get a mixture of this than you coul
with the hard fat itself. This evidently was put into a flour in or
der to take on the texture of the flour, to facilitate the chance o
putting it into a fat.

Q. 23. What would be the result of having that out with the housewives and the cooks to be used in the recipes they have for cooking?

A. Well, I am very sure that the housewives would not have to readjust their recipes. This has the percentage of flour in it. She does not have to figure it, her recipes have been adjusted, and she would not have to figure out her recipes, have the percentage of flour mixed with her fat, so there would have to be a readjustment of recipes that are already accurate.

Q. 24. Is there any objection to that readjusting of the recipes?

A. Domestic science really has not gotten very far and it is too bad to make her go all over it again.

Q. 25. You spoke of the objections to the use of cooking oils in not furnishing sufficient steam for the batter or pastry mix-
797 ture. Are there any other objections to the use of cooking oils instead of the lard substitutes and the lard?

A. It is harder to mix those. We expect that it takes more mechanical mixing to get those in than it would a harder fat.

Q. 26. What is the result, if it is not properly mixed?

A. Then it stays in spots, making a soggy spot. We get that often in pastry, where we experiment with oils, because if the flour is deluged at one point with the fat it is very hard to have that same spot saturated with water, and we get a paste that is not as light as it would be if we had put in a harder fat in the first instance.

Q. 27. Is it usual in ordinary cooking to use cooking fat in making bread?

A. In home cooking we do use fat in bread, but we find we make a very good loaf of bread without fat.

Q. 28. You make a very good loaf without the fat?

A. Yes, sir.

Q. 29. Why is it that the bakeries use a cooking fat or cooking oils in bread, whereas in the home cooking the bread is made without it?

A. Well, I suppose it is really quite hard to tell just why they do that, but it is true that the bakery uses a blend of flours, that it could not use the flour that is used by the housewife and come out ahead in a business way. So in using a blend of flours, I think I have a right to say those are not as good flours as the housewife uses. The baker gets a loaf that will stand up by putting in additional richness or shortening.

Q. 30. That is the reason the shortening is used in the bakeries, for holding up and making a better loaf with poorer grade flours?

A. That is one of the reasons, yes.

798 Cross-examination.

By Mr. Pennie:

X Q. 31. Do you know what kind of flour the Ward Baking Company uses in its bakery in the Bronx in this City?

A. No, I do not know.

X Q. 32. Then you do not know that they use a flour called "Pillsbury's Best"?

A. When I spoke of bakeries, I was thinking of the minor ones.

X Q. 33. You were not speaking of the larger ones?

A. No, sir.

X Q. 34. The difficulty that you have indicated of carefully incorporating and fully incorporating an oil in the batch of flour that you happen to be treating in cooking is one of mechanical manipulation, is it not?

A. It is, in cakes and those things, but in pastry it is more subtle than that.

X Q. 35. In pastry it is a matter of the skill of the cook—that is, some cooks are able to do it better than others, is that true?

A. I think that any person would experience difficulty using the housewife's recipes in pastry making in incorporating an oil in the place of a fat.

X Q. 36. In other words, her recipes, as you put it just a little while ago, would have to be recast?

A. I should say so.

X Q. 37. So she would have to adapt her practice to oil instead of lard?

A. I should say so.

X Q. 38. As I understand it, the ordinary cook as we all know from more or less sad experience, sometimes has difficulty in getting lard properly incorporated in the batch; isn't that so?

A. Why, it is reasonable. I suppose that it could be so.

X Q. 39. That is the reason we have cooking schools, is it not, so that the instructors there may properly give directions to those who are interested in matters of that kind, so that they will learn
799 how to incorporate shortening, for instance, in articles of food; that is true, is it not?

A. Yes, sir; that is one of the reasons.

X Q. 40. That is one of the functions of the school?

A. Yes, sir.

X Q. 41. So also if the housewife is to incorporate hard fat into the particular batch undergoing manipulation her series of recipes would have to be adjusted to that practice, would they not?

A. She should have some explanation on it, yes, and would require a special techniue.

X Q. 42. For instance, in Defendant's Exhibit K-2, to which your attention has been brought, there seems to be a very intimate incorporation of the shortening agent with the flour there?

A. Yes.

X Q. 43. And a flour of that kind would be appropriate as a flour in domestic cooking, would it not, to the extent of the shortening that is in it?

A. Well, it would be a flour plus that. You would have to diminish the amount of other shortening if this is to take the place of shortening.

X Q. 44. You can see no objection to a flour of that kind for use in ordinary cooking for the value of the shortening that is in the flour?

A. Providing we could instruct the women just how to readjust her recipes so as to incorporate this with the same result that she gets otherwise.

X Q. 45. Do you know enough about the chemistry of digestion to understand what happens to a fat after it goes into the human stomach?

A. As I understand, it is not digested in the stomach.

X Q. 46. When the fat goes into the human organism for digestion, is it not true that there then occurs a splitting up of the fat into the fatty acid and glycerine?

A. That reaction occurs, yes.

800 X Q. 47. And what is true in regard to all of the different elements of the fat—that is, the various glycerids making up the fat?

A. I should say that that is true, yes.

X Q. 48. So that all fats, then ultimately in the course of digestion are split up into fatty acids and glycerine and in that form they enter into the economy of the body—that is your understanding?

A. But they have to melt in the body in order to undergo that reaction.

X Q. 49. But after they have split up, that is what happens, is it not?

A. Yes.

X Q. 50. You are, of course, aware of the use of suet in domestic cooking, are you not?

A. Yes, sir.

X Q. 51. And in the making of various batches in which flour is one of the constituents, for instance, Yorkshire pudding, you know of that, do you not?

A. I know what Yorkshire pudding is, yes.

X Q. 52. You know that it is made up by the use of suet incorporated with flour, do you not?

A. I think not, as I have a rather hazy idea of how the Yorkshire pudding is put together, not having made more than one or two.

X Q. 53. As far as Yorkshire pudding is concerned, you do not pose as an expert?

A. I should not want to.

X Q. 54. You do know however, that suet is used largely in the preparation of food for human consumption?

A. I know that people use it, yes.

X Q. 55. Do you happen to know that suet contains about fifty per cent. of stearin?

A. I should imagine that was true, yes.

X Q. 56. So there is nothing in that large percentage of stearin that renders it at all inedible, is there, or improperly incorporated into the food product that is to be prepared and eaten?

801 A. If it were in this form that probably would be minimized, but in the form that the housewife would ordinarily

use it, it is a difficult matter to manipulate. There would still be that hard and objectionable fat. We ordinarily do not think of putting suet, in; we do not look upon that as an ordinary kitchen fat for flour mixtures and that kind of work.

X Q. 57. If you were using suet to be incorporated with flour in an article of food you would probably either chop it up very fine or you would melt it and mix the flour in it and then chop that up very fine, would you not—grind it?

A. That could be done, yes.

X Q. 58. That would be feasible in domestic economy if not house economy?

A. But it seems from my point of view it would be better to do other things with that hard fat, as there is only a small percentage of it that the housewife would have anyway.

X Q. 59. The housewife usually keeps on the stove in economic households some receptacle in which mutton drippings and beef drippings are stored for various uses; that is true, is it not?

A. She keeps the more desirable beef fats; I think there are very few women who keep mutton fats.

X Q. 60. And those are used by the housewife in place of lard wherever it is desirable to do that, from an economical standpoint, that is true, is it not?

A. She uses them as drippings. She may do many things with them. She may grease pans with them. In the households of New York to-day I am sure that the women do not have any more than enough to grease their pans, of that kind of fat. Of course, outside of New York there would be a great deal more than that, but I am speaking now of the women in New York.

802 X Q. 61. In New York City they are not quite as economical perhaps as in the country—that is what you intend to say?

A. The point is there would not be so much of that where meat is eaten as it is in the cities, and perhaps where the economy is not as keen as it would be outside of a large center. But the ordinary household does not have enough of that fat to really bake things with it.

X Q. 62. You have had some experience, also, in the use of what are known as lard compounds. You know what I mean, do you not?

A. Yes, sir.

X Q. 63. Those are used in about the same way lard is, are they not?

A. Yes, sir.

X Q. 64. In the making of pie crust is it not the practice to so work in a part of the lard that there shall be a layer of lard and flour of a richer consistency intermediate of the top and bottom of the crust?

A. I think in ordinary practice in making the simple crusts that are made in the home, no layer is attempted. That is only done in the more elaborate cakes.

X Q. 65. If you were trying to do the same thing with oil, with cotton-seed oil, you would follow that same practice that you would

UNITED STATES PATENT OFFICE.

JOHN J. BURCHENAL, OF CINCINNATI, OHIO, ASSIGNOR TO THE PROCTER AND GAMBLE COMPANY, OF CINCINNATI, OHIO, A CORPORATION OF OHIO.

FOOD PRODUCT.

1,133,351. Specification of Letters Patent. Patented Apr. 13, 1915.

No Drawing. Application filed November 10, 1910. Serial No. 591,786.

To all whom it may concern:

Be it known that I, JOHN J. BURCHENAL, a citizen of the United States, and a resident of the city of Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Food Products, of which the following is a specification.

This invention is a food product consisting of a vegetable oil, preferably cotton-seed oil, partially hydrogenized and hardened to a homogeneous white or yellowish semi-solid closely simulating lard.

The special object of the invention is to provide a new food product for a shortening in cooking, in which the liability to become rancid is minimized, and in which the components of such vegetable oils which are inferior and detrimental to use as such a food product have been to a large extent converted into a higher and more wholesome form. All such vegetable oils contain glycerids of unsaturated fatty acids, and among these, notable quantities of fatty glycerids of lower saturation than olein. It is the presence of these glycerids of lower saturation that seriously affects the rancidity of the material. Oxidation is largely the cause of rancidity, which oxidation weakens the fat at the point of absorption at the double bonds, and these glycerids of lesser saturation readily absorb oxygen from the air at ordinary temperatures, while the more highly saturated glycerids, as olein, only absorb oxygen at elevated temperatures. It is evident, therefore, that oils or fats containing notable quantities of glycerids of linolic acid, or of lesser saturation, are distinctly inferior as an edible product to those containing a minimum of these glycerids with a larger per cent. of olein. On the other hand, while it is important to get rid of the readily oxidizable glycerids of lower saturation, it is also important not to supply too large a per cent. of fully saturated glycerids. The saturated glycerids of the arachidic, stearic, palmitic and other groups are of very small value for shortening, inasmuch as it is the liquid fats which contribute this value to the material. Saturated fats, however, serve the purpose of congealing the shortening within the food, and thus retain it equally distributed throughout the whole. Oil, liquid at the ordinary temperatures, does not make the best shortening, because the oil remains liquid, keeping the food in a soggy condition, and the oil will even settle to the under part of the cooked product and soil the cloth, paper, or whatever it may come in contact with. Moreover, fats of a melting point above the temperature of the human body, 98° F., are not so digestible as fats which are liquid at this point, or which have a melting point below 98° F. It is, therefore, my object in the preparation of my new lard-like composition and food-product, and in preparing same from cottonseed oil, to change the chemical composition of the oil to obtain a product with a high percentage of olein, a low percentage of linolin and the lesser-saturated fats, and with only sufficient stearin to make the product congeal at ordinary temperatures.

In manufacturing this product, cotton-seed or other vegetable oil is caused to chemically absorb a limited amount of hydrogen by reacting on the oil with hydrogen in the presence of a catalytic agent and at an elevated temperature. The oil is preferably agitated in a closed vessel in the presence of an atmosphere of compressed hydrogen, a catalyser of finely-divided nickel carried by kieselguhr being maintained in suspension in the oil and its temperature being raised to about 155° C.

According to the present invention, the amount of hydrogen absorbed is carefully regulated and limited. In practice, the operation is stopped when the oil has been converted into a product which cools to a white or yellowish semi-solid more closely resembling lard than do the commercial mixtures of cotton-seed oil and animal oleo-stearin, while in many respects the product is superior to the best leaf lard as a shortening. It is not so liable to become rancid and the product can be heated to a considerably higher temperature than lard without smoking or burning. The high temperature to which my product can be raised without smoking or burning makes the product ideal for frying, inasmuch as a crust forms almost instantly on the food fried, which prevents any absorption of the shortening. A lard-like product thus prepared from cottonseed oil has a saponification value of about 195; and an iodin value ranging from about 55 to about 80. The product having an iodin value of 55 has a titer of about 42° and a

melting-point of about 40° C.; that having an iodin value of 80 has a titer of about 35° and a melting-point of about 33° C. While but partially hydrogenized, containing from about 1.5% to 2.5% of additional hydrogen more than in the nonhydrogenized material, it shows no free cottonseed oil when subjected to the Halphen test, thereby differing from all commercial lard substitutes containing this oil. It contains from twenty to twenty-five per cent. of fully saturated glycerids, from five to ten per cent. linolin and from sixty-five to seventy-five per cent. olein, and an average of a number of samples gives twenty-three per cent. of saturated fats, seven and five-tenths per cent. linolin and sixty-nine and five-tenths per cent. olein, while the cottonseed oil before treatment contained seventeen per cent. saturated fats, thirty-seven per cent, linolin and forty-six per cent. olein. It will thus be seen that I have produced an ideal food product, which is high in olein, low in linolin and lesser-saturated fats, and with only enough stearin to make the product congeal at ordinary temperatures.

A lard-like composition comprising edible hydrogenized fatty oil, specifically hydrogenized vegetable oil, is claimed in my copending application Serial No. 591,727, filed November 10, 1910.

I claim:

1. A homogeneous lard-like food product consisting of an incompletely hydrogenized vegetable oil.

2. A homogeneous lard-like food product consisting of incompletely hydrogenized cottonseed oil.

3. A homogeneous lard-like food product consisting of an incompletely hydrogenized vegetable oil, said product being a semi-solid having an iodin value ranging from about 55 to about 80.

4. A homogeneous lard-like food product consisting of incompletely hydrogenized cottonseed oil, said product being a white or yellowish semi-solid having, approximately, an iodin value of 55 to 80, a melting-point of 40 to 33° C., a titer of 42 to 35° C., and giving no reaction for cotton-seed oil under the Halphen test.

5. A food product, composed of glycerids of saturated and unsaturated fatty acids in substantially the proportions of from twenty to twenty-five per cent. of saturated fats, five to ten per cent. of fats of lesser saturation than olein, and sixty-five to seventy-five per cent. of fats of a saturation corresponding to that of olein.

6. A food product, composed of glycerids of saturated and unsaturated fatty acids in substantially the proportions of from twenty to twenty-five per cent. of stearin, five to ten per cent. of linolin, and sixty-five to seventy-five per cent. of olein.

7. A food product, composed of glycerids of saturated and unsaturated fatty acids in substantially the proportions of twenty-three per cent. of stearin, seven and five-tenths per cent. of linolin, and sixty-nine and five-tenths per cent. olein.

JOHN J. BURCHENAL.

Attest:
H. G. FRENCH,
P. B. HEDD.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

if you were using lard in manufacturing pie crust; that is true, is it not?

A. Well, the housewife would take a given amount of flour and she would treat that in such a way that she would get a certain amount of crust. She builds back from the flour rather than to build from the shortening.

X Q. 66. That she would do whether she was using lard or oil?

A. Yes.

Both sides rest.

Argument set for April 28th, 1917, at ten thirty A. M.

(Here follows specification marked pages 803 and 804.)

805 COMPLAINANT'S EXHIBIT No. 2.

United States District Court, Southern District of New York.

In Equity. No. 13-100. On patent #1,135,351.

THE PROCTER & GAMBLE COMPANY, Plaintiff,

vs.

BERLIN MILLS COMPANY, Defendant.

Stipulation.

It is stipulated and agreed that prior to the commencement of this suit and subsequent to notice of infringement of the patent in suit defendant herein sold in the City of New York, Borough of Manhattan, cans of "Kream Krisp," like the can and product marked "Plaintiff's Exhibit, Defendant's Product" and bearing similar labels and wrappers to those on the said exhibit; and that the defendant has issued and circulated in the trade pamphlets (copies of which are hereto attached) marked "Plaintiff's Exhibits, Defendant's Pamphlets 'A,' 'B,' and 'C.'"

It is further stipulated that the product contained in the said cans was made by the defendant from cottonseed oil by the addition of hydrogen.

KERR, PAGE, COOPER & HAYWARD,
Counsel for Plaintiff.

JOHN C. PENNIE,
Counsel for Defendant.

Dated, March 17, 1917.

(Here follow reproductions of booklets, specifications and drawings marked pages 806 to 873, inclusive.)

More Economical Than Lard
Better Than Butter

FOR CAKE MAKING
FOR SHORTENING
FOR FRYING

FOR BETTER FOOD
AND SOUND ECONOMY
USE KREAM KRISP

Manufactured under a New and
Patented Process by the

BERLIN MILLS COMPANY
PORTLAND, MAINE

1

You Can Cut Your Lard Bill Squarely in Two, With Kream Krisp

WHY? Because you will use from one-quarter to one-half less, in every kind of cooking where you have used lard.

Because Kream Krisp KEEPS. It is an absolutely pure vegetable fat, and contains nothing to "spoil."

Because you can use Kream Krisp over and over again until it is all consumed in cooking; and it will not soak up the flavors of foods cooked in it.

Because you can use it everywhere that you would use lard: in cakes, pastry, frying, etc. The most delicate patties can be cooked in it; the most delicious *creamed oysters* can be prepared with it. *It gives no taint of oil to cooked foods.* Use Kream Krisp; and you will not require one ounce of lard in your larder.

Kream Krisp is the first practical *improvement* over lard for the household. It is not only more economical than lard; it is *better* than lard. Your cooking will be better flavored, and more dainty, with Kream Krisp.

2

DOMESTIC ECONOMY

You Can Greatly Reduce Your Butter Bill, by Using Kream Krisp

WHY? Because Kream Krisp is better than butter wherever you require a shortening. Many people who refuse to use ordinary vegetable "oil compounds" in delicate cooking, and who dislike lard, are in the habit of using a high-priced butter for cooking.

In fact, few housewives are willing to use either lard or any of the various lard or butter substitutes in preparing cakes and puddings. But Kream Krisp can be used in the preparation of the most delicious cake.

Kream Krisp shortens better than lard, or any "compound," and leaves as delicate a flavor as if butter were used. Use it with a little salt and save your butter.

A single experiment will convince you. Use it as you would butter, but in smaller quantities.

Experts in domestic science have proved that four cents' worth of Kream Krisp makes just as good cake as twenty cents' worth of the best butter.

GIVE YOUR FAMILY PURE FOOD AND SAVE MONEY

Kream Krisp is a refined vegetable oil "set" to the consistence of lard and sealed in air-tight tins by machinery. It is never touched by hands, and is absolutely clean

The purest lard you can buy is taken from the abdominal tissues of the hog, and washed and "rendered" to improve its appearance, but it is none the less an animal product, which is often repugnant to a delicate digestion.

Kream Krisp is as pure as the purest olive oil and the most sensitive stomach easily digests it.

Avoid excessive quantities of fats

Pure fat, in moderation, is a necessary food; but greasy foods are bad. Use Kream Krisp and you will avoid all excess of fats in frying. Why? Because when you cook with lard or butter, the animal substances will smoke and burn at a moderate heat; you have to work them at a temperature which requires prolonged cooking.

Kream Krisp, which contains no animal substance whatever, can be heated fifty de-

that but little fat can be absorbed.

Use Kream Krisp and your food will remain fresh

You can keep a tin of Kream Krisp open to the air in a warm room indefinitely. There is nothing in it to turn rancid. Cakes baked with Kream Krisp remain perfectly sweet. We have experimented on this line beyond all reasonable household requirements, and we find that delicate cakes made with Kream Krisp will remain sweet for many months.

Kream Krisp will not turn rancid, either in the pail or in anything cooked with it. It contains no preservatives of any kind. It is simply a pure vegetable fat.

Positive Guarantee of Purity

The Berlin Mills Company absolutely guarantees the purity and wholesomeness of Kream Krisp.

This guarantee not only covers the formal requirements of law which govern the manufacture of food products, but carries the further positive assurance that this product contains no ingredients whatever, except pure vegetable oil hardened to the consistence of lard by a patented process which absolutely does away with the beef stearin and other stiffening ingredients used in lard and lard substitutes.

Proceed as you would with lard or butter, but note carefully that three tablespoonfuls of Kream Krisp will shorten as much flour as four tablespoonfuls of lard.

If you are using Kream Krisp in place of butter, you may cut down the quantity still further, using only two-thirds as much Kream Krisp as you would use of butter.

Professional cooks are now making delicious Kream Krisp cake with Kream Krisp instead of butter, and using only *one-half* the quantity given in the recipes for butter.

Also remember, when frying, especially in deep fat, that you can save money and get better results if you will heat Kream Krisp hot enough to brown bread crumbs in thirty seconds.

To prove to yourself just how good Kream Krisp really is, *try it* on any of the following, using standard recipes, but reducing the amount of fat as just indicated:

SPONGE CAKE, POUND CAKE, MARBLE CAKE, CHOCOLATE CAKE, FRUIT CAKE, DOUGHNUTS, CRULLERS, BREAD (white or graham), BREAKFAST ROLLS, CREAM OF TARTAR BISCUITS, FRITTERS, WAFFLES GINGERBREAD

BERLIN MILLS CO. VS. PROCTER & GAMBLE CO. 507

GENERAL DIRECTIONS—Cont'd

After you have tried Kream Krisp once or twice, you will see that *it shortens better than lard, and yields results as delicate and dainty as the best dairy butter.*

You will then be ready to put it into regular use in all cooking, in place of lard and butter. You can make delicious pie crust, turn-overs and tarts, if you will remember to cut down the quantity of shortening used, for Kream Krisp is a better shortening than either lard or butter, and a smaller quantity is needed.

You will quickly note that anything you may cook with Kream Krisp remains fresh and sweet.

In this respect Kream Krisp is a wonderful improvement over lard, butter, and the so-called "compounds."

The reason for this is a simple one. The quality that turns butter, lard, etc., rancid, is the quality of absorbing oxygen. Kream Krisp contains nothing which oxidizes readily; hence it resists oxidation far better than lard, butter, or any other cooking fat in use.

SEEING IS BELIEVING

GIVE KREAM KRISP A TRIAL
AND YOU WILL BE
QUICKLY CONVINCED

BOOKLET NO. 4
FEBRUARY, 1915

Purely Vegetable

KREAM KRISP

RECIPES

FOR CAKE MAKING
FOR SHORTENING
FOR FRYING

Complete Cook Book
Mailed on Request

Kream Krisp is a
PURE FOOD
GUARANTEED
in accordance with the
WESTFIELD STANDARD

Manufactured under a New
Process (Patented) by the

BERLIN MILLS COMPANY
(ESTABLISHED 1892)
PORTLAND, ME.

NOTE THE FOLLOWING AND THEN TRY KREAM KRISP

The following recipes are given as examples of the use of Kream Krisp, **in place of lard and butter**, in cakes and "cookies," bread, pastry and puddings, and for deep frying.

Many of the recipes here shown are in daily use for the demonstrations of Kream Krisp now being given in the leading grocery and department stores.

Kream Krisp is sold on the strength of these actual proofs that it is

MORE ECONOMICAL THAN LARD AND BETTER THAN BUTTER

for frying, for shortening, for cake-making—for all good cooking.

Vegetable oils, and cooking compounds containing such oils, have been in use for many years, and have largely taken the place of lard for cooking, wherever the distinctive flavor of the oil has not been objectionable.

They have been used as cheap substitutes.

But not until the advent of Kream Krisp has it been practicable for the housewife to **do better cooking**, and produce more delicately flavored articles of food, with the aid of a vegetable shortening, than if lard, or even butter were used.

Kream Krisp, although **made exclusively from** highly refined vegetable oil, **contains no oil itself!** The oil is **completely changed** by hydrogenation, under the influence of heat, to a butter-like substance; and the oily flavor completely disappears in this process, leaving in Kream Krisp only the most wholesome and delicate elements, exactly adapted to high-grade cooking.

For this reason Kream Krisp has been called one of the **most notable discoveries in pure-food chemistry of the present day.**

Plaintiff's Exhibit, Defendants Pamphlet B
8064
BERLIN MILLS CO. VS. PROCTER & GAMBLE CO.
50

KREAM KRISP COOKIES

BROWN SUGAR COOKIES

2 cups brown sugar
¼ " Kream Krisp
1 dessertspoon cinnamon
1 " cloves
1 teaspoon salt
1 even teaspoon soda
3 eggs
1½ cups flour
Set away over night and chill

Work the sugar and Kream Krisp to a smooth cream. Add to this the eggs well beaten and the milk. Mix and sift together the dry ingredients and add to the first mixture. Add enough flour to make a soft dough, and set aside in a cool place till thoroughly chilled. Toss one-half the mixture at a time on a slightly floured board and roll out very thin and bake in a moderate oven.

KREAM KRISP IS WHOLESOME. Not only is it a pure food, free from all adulteration, but it contains no hard fats—such as beef stearin. It is of low melting point, and easily assimilated by the digestive organs.

KREAM KRISP

FRENCH FRIED POTATOES

Wash, pare and cut potatoes in one-eighth inch strips. Soak one hour in cold water and dry thoroughly in towels. Place them in a wire basket. Heat Kream Krisp in kettle to smoking point and lower the wire basket containing potatoes into the melted fat. Hold the heat just short of the smoking point for fifteen minutes, stirring the potatoes occasionally, so that they will cook evenly. When well browned, remove in basket and drain.

KREAM KRISP IS A NATURAL PURE FOOD PRODUCT (Guaranteed) It is is nothing but a pure vegetable oil hardened to the consistence of lard by a process which positively eliminates the impurities commonly found in lard and butter, and which are always present in lard compounds. It is a better food for cooking purposes than lard or butter.

IN CONCLUSION

Kream Krisp is a wholesome, appetizing, purely vegetable shortening, better than lard for frying, better than butter for cake and pastry, and a great money-saver for all good cooking.

See pages 14 and 15

BERLIN MILLS CO. VS. PROCTER & GAMBLE CO.
1806 B

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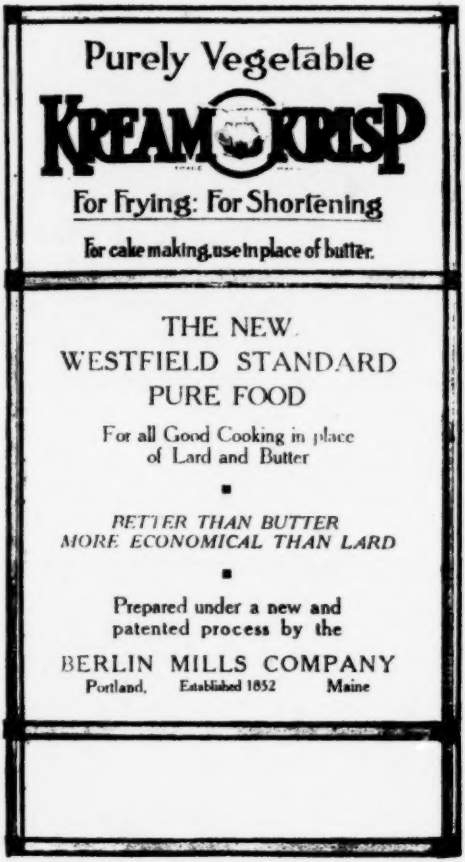
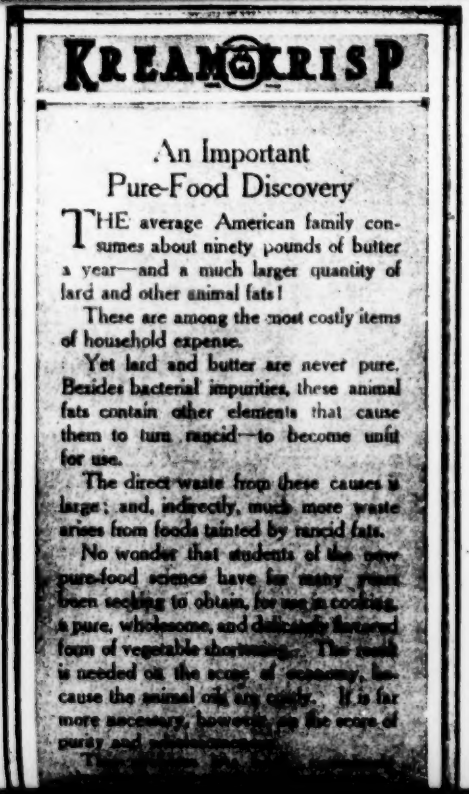

Purely Vegetable
KREAM-O-KRISP
For Frying: For Shortening
For cake making, use in place of butter.
THE NEW
WESTFIELD STANDARD
PURE FOOD
For all Good Cooking in place of Lard and Butter
BETTER THAN BUTTER
MORE ECONOMICAL THAN LARD
Prepared under a new and patented process by the
BERLIN MILLS COMPANY
Portland, Established 1852 Maine



KREAM KRISP

An Important Pure-Food Discovery

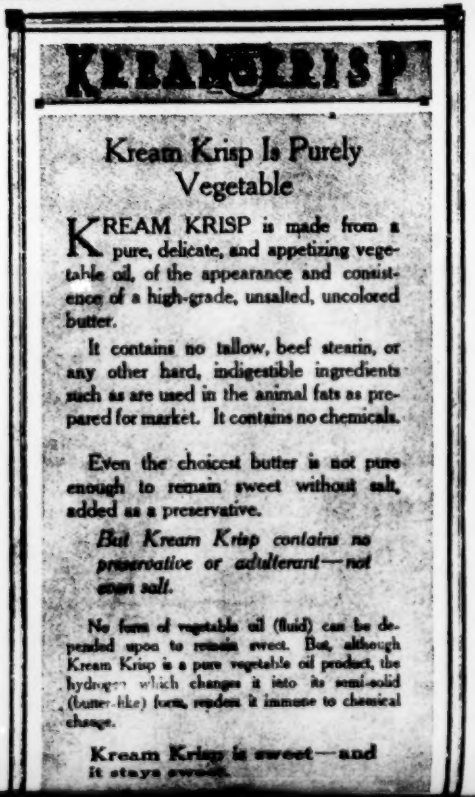
THE average American family consumes about ninety pounds of butter a year—and a much larger quantity of lard and other animal fats!

These are among the most costly items of household expense.

Yet lard and butter are never pure. Besides bacterial impurities, these animal fats contain other elements that cause them to turn rancid—to become unfit for use.

The direct waste from these causes is large; and, indirectly, much more waste arises from foods tainted by rancid fats.

No wonder that students of the new pure-food science have for many years been seeking to obtain, for use in cooking, a pure, wholesome, and delicately flavored form of vegetable shortening. The result is needed on the score of economy, because the animal oils are costly. It is far more necessary, however, on the score of purity and wholesomeness.



KREAM KRISP

Kream Krisp Is Purely Vegetable

KREAM KRISP is made from a pure, delicate, and appetizing vegetable oil, of the appearance and consistence of a high-grade, unsalted, uncolored butter.

It contains no tallow, beef stearin, or any other hard, indigestible ingredients such as are used in the animal fats as prepared for market. It contains no chemicals.

Even the choicest butter is not pure enough to remain sweet without salt, added as a preservative.

But Kream Krisp contains no preservative or adulterant—not even salt.

No form of vegetable oil (fluid) can be depended upon to remain sweet. But, although Kream Krisp is a pure vegetable oil product, the hydrogen which changes it into its semi-solid (butter-like) form, renders it immune to chemical change.

Kream Krisp is sweet—and it stays sweet.

KREAM-KRISP

A Wholesome, Pure Food

THE free fatty acids common to butter, lard, and cooking oils, are distinctly irritating to the digestive organs. Their hurtful effect appears in indigestion.

Even the best butter is no purer than the fat of the cream that goes into the churn. It is never free from bacterial matter.

The impurity of lard is too well known to require discussion.

But Kream Krisp is pure to start with, and in the process of manufacture it is cooked at a sterilizing temperature!

As a further safeguard it is delivered direct to the cans, in which it is to be sealed for shipment, without handling or delay. Every precaution is taken to ensure cleanliness and freedom from germs.

KREAM-KRISP

A Money Saver

IT rarely occurs that any distinct advance is made in the *purity* of food articles, without an increase in their *cost*. But Kream Krisp is, at the same time,

the purest and the most economical form of food for use in place of lard and butter.

In this respect it excels lard and butter, as well as all the so-called substitutes for lard and butter.

Kream Krisp itself is *not* a substitute; it is an *improvement* over all former kinds of shortening. For example, "one cupful of Kream Krisp" always means exactly one cupful of shortening. Lard and butter vary widely in the character and amount of substances added to the animal fats.

In the following pages you will find still more important economies, enabling you to save one half of your present bill for lard and butter.

KREAM KRISP

Doing the Work of Lard at Half the Expense

KREAM KRISP is better than lard —it is purer, more wholesome, and avoids the "greasiness" common to foods cooked in lard.

But in addition to this it will save you one half the amount you have been spending for lard.

This economy is accounted for as follows:

1. For shortening, you will use from one quarter to one half less of Kream Krisp than you have been using of lard, because it is a 100% efficient shortening. It contains no beef stearin, or other hardening material, to hold it in proper consistency. All lard contains a large proportion of stearin which is not efficient for shortening.

2. You cannot use the same kettleful of lard for deep frying different foods, for the flavor of one food is absorbed by the fat and carried over to the next cooking. *But Kream Krisp does not take up the odors of foods. One bottle of Kream Krisp will do all your frying, until it is used up. Simply strain out the particles of food after frying.*

3. There is no waste in Kream Krisp. It does not [illegible]

KREAM KRISP

Better than Butter for Cooking

And Saves 83 Cents on the Dollar

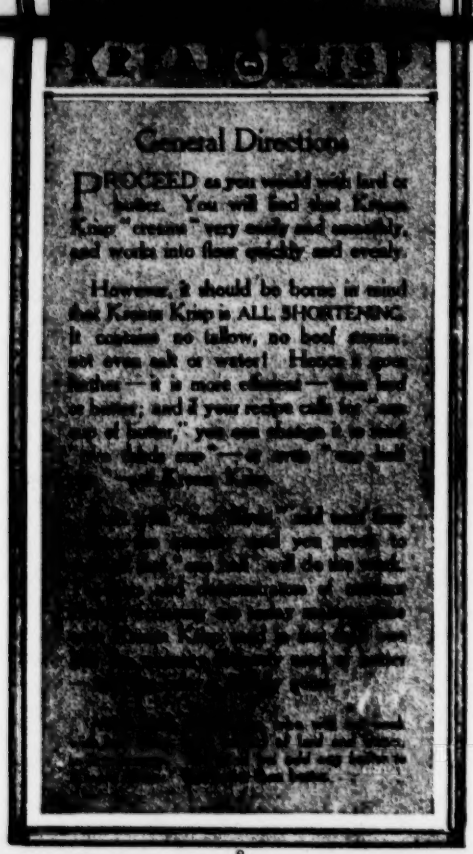
(See page 23)

EVEN the finest creamery butter quickly "turns." Kream Krisp *does not* become rancid. It is purer than the purest butter—also whiter. (Try it in "white cake"!)

It is also more economical. It keeps without ice (a most important economy, especially in hot weather when butter turns "rancid" very quickly); its cost price is less than one half the average price of butter; and you can use from one third to one half less of it than you have been using of butter, with equally good results.

Try Kream Krisp for your finest cooking—and thereafter you will buy butter only for table use.

Try it for frying, or deep frying, and you will produce more dainty [illegible]



General Directions

PROCEED as you would with lard or butter. You will find that Kream Krisp "creams" very easily and smoothly, and works into flour quickly and evenly.

However, it should be borne in mind that Kream Krisp is ALL SHORTENING. It contains no tallow, no beef stearin, not even salt or water! Hence it goes further — it is more efficient — than lard or butter; and if your recipe calls for "one cup of butter," you can shorten it to [illegible] cup — or even "one half [illegible]

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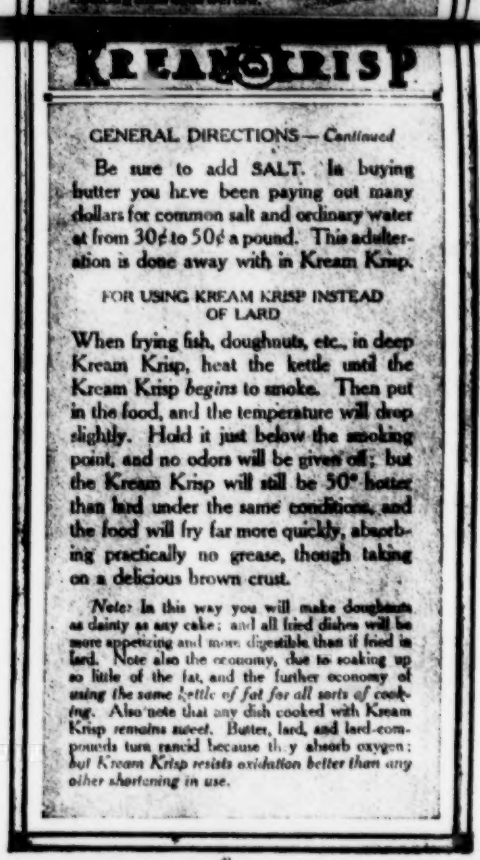


GENERAL DIRECTIONS — *Continued*

Be sure to add SALT. In buying butter you have been paying out many dollars for common salt and ordinary water at from 30¢ to 50¢ a pound. This adulteration is done away with in Kream Krisp.

FOR USING KREAM KRISP INSTEAD OF LARD

When frying fish, doughnuts, etc., in deep Kream Krisp, heat the kettle until the Kream Krisp *begins* to smoke. Then put in the food, and the temperature will drop slightly. Hold it just below the smoking point, and no odors will be given off; but the Kream Krisp will still be 50° hotter than lard under the same conditions, and the food will fry far more quickly, absorbing practically no grease, though taking on a delicious brown crust.

Note: In this way you will make doughnuts as dainty as any cake; and all fried dishes will be more appetizing and more digestible than if fried in lard. Note also the economy, due to soaking up so little of the fat, and the further economy of *using the same kettle of fat for all sorts of cooking.* Also note that any dish cooked with Kream Krisp *remains sweet.* Butter, lard, and lard-compounds turn rancid because they absorb oxygen; *but Kream Krisp resists oxidation better than any other shortening in use.*

7

KREAM KRISP

Note the Following Facts and Then Try Kream Krisp

THE following recipes are given in exemplification of the use of Kream Krisp, *in place of lard and butter.* Many of the recipes here shown are in daily use for the demonstrations of Kream Krisp now being given in the leading grocery and department stores, for Kream Krisp is sold on the strength of these actual proofs that it is

more economical than lard and butter
than butter

for frying, for shortening, for cake-making—for *all* good cooking.

Vegetable oils, and cooking compounds containing such oils, have been in use for many years, and have largely taken the place of lard for cooking, wherever the distinctive flavor of the oil has not been objectionable.

But they have been used as cheap substitutes.

Not until the advent of Kream Krisp has it been practicable for the housewife to do *better cooking*, and produce more delicately flavored articles of food, with the aid of a vegetable shortening, than if lard, or even butter, were used.

Kream Krisp, although made exclusively from highly refined vegetable oil, *contains no oil itself.* The oil is *completely changed* to a butter-like substance; and the oily flavor completely disappears in this process, leaving in Kream Krisp only the most wholesome and delicate elements, exactly adapted for high-grade cooking. For this reason Kream Krisp has been called one of the most valuable pure food discoveries of the present day.

KREAM KRISP

Kream Krisp Cakes

SIMPLE DARK CAKE

½ cup sugar
½ " Kream Krisp
1 egg
½ cup molasses
½ " sour milk
2 " flour
½ teaspoon soda
1 " salt
½ " each, cassia, cloves, nutmeg
1 " baking powder

Beat sugar and Kream Krisp. Add egg well beaten, then milk, molasses, and flour with spice, salt, soda, and baking powder sifted in. Bake in shallow tin, moderate oven, thirty minutes. May use sweet milk and 2 teaspoons baking powder.

KREAM KRISP IS PURE FOOD. It contains absolutely no coloring or preservative substances. It is *a Westfield Standard Food*

DEPARTMENT OF PUBLIC HEALTH WESTFIELD, MASS.

DEPARTMENT OF PUBLIC HEALTH WESTFIELD, MASS.

REPORT OF CHEMICAL ANALYSIS

Sample Krem Krisp

Obtained from XXXXXXXXXXXX

Manufactured by Berlin Mills Co.

Acidity, as Free Fatty acid	0.08%
Acid Number	0.25
Specific Gravity	0.9811
Coal Tar Dye	none
Vegetable Colors (artificial)	none
Alcohol (Ethyl)	
Alcohol (Methyl)	
Ash	
Total Solids	Trace only, unweighable
Moisture	
Cottonseed Oil, Melting point	0.00%
Fat or Ether Extract	120.8 F.
Essential Oils	
Fixed Oils, unsaponifiable matter	
Antiseptics, Sulphur dioxid	None
Cold Water Extract	None detected
Hot Water Extract	
Crude Fiber	
Carbohydrates	none
Paraffin, Smoking point	none
Calories per pound	418.4 F.
Preservatives	
Miscellaneous	
Adulterations (Prohibited)	
Adulterations (Injurious)	none detected
Quality	none detected
	Excellent

REMARKS We believe this to be a pure vegetable fat of excellent quality, and find no adulteration therein. Its freedom from free fatty acids and its high smoking point is particularly commendable

I hereby certify that the above is correct to the best of my knowledge.

Date March 5th 1915 L. B. Allyn Analyst.

12 13

KREAM KRISP

Kream Krisp Cakes

ONE EGG CAKE

¼ cup Kream Krisp
½ " sugar
1 egg
1 cup milk
1½ cups flour
1 small teaspoon salt
2½ teaspoons baking powder
1 " vanilla

Cream sugar and Kream Krisp, add egg beaten until light and fluffy. Sift baking powder and salt into flour, and add alternately with milk. Bake in shallow pan, thirty minutes, fairly hot oven.

KREAM KRISP IS PURELY VEGETABLE. It does not contain a particle of any animal substance. It is not only "as good as lard;" — it is better, purer, and far more dainty.

KREAM KRISP

Kream Krisp Cookies

BROWN SUGAR COOKIES

2 cups brown sugar
¾ " Kream Krisp
1 dessertspoon cinnamon
1 " cloves
1 teaspoon salt
1 even teaspoon soda
3 eggs
1½ cups flour
Set away over night and chill

Work the sugar and Kream Krisp to a smooth cream. Add to this the eggs well beaten and the milk. Mix and sift together the dry ingredients and add to the first mixture. Add enough flour to make a soft dough, and set aside in a cool place till thoroughly chilled. Toss one half the mixture at a time on a slightly floured board and roll out very thin and bake in a moderate oven.

KREAM KRISP IS WHOLESOME. Not only is it a pure food, free from all adulteration, but it contains no heart fats — such as beef stearin. It is of low melting point and easily assimilated by the digestive organs.

KREAM KRISP

Kream Krisp Cookies

SOFT GINGER COOKIES

1 cup molasses
½ " Kream Krisp (scant measure)
2 teaspoons ginger
3 level teaspoons of soda
½ teaspoon salt

Heat the molasses and melt the shortening in it, stirring it in thoroughly. Dissolve soda in ½ cup cold water and add to the molasses and shortening, when they have cooled a little. Mix the salt and ginger with a little flour and add to the liquid ingredients. Then stir in just enough more flour to make a dough which you can roll. Set away to become very cold, then roll out, cut, and bake in a hot oven. Care should be taken not to add too much flour.

KREAM KRISP IS APPETIZING AND DAINTY. It gives off no offensive odors in cooking, and imparts no taint of oil, even to the most delicate cakes. It is *better than butter* in this important point.

KREAM KRISP

Kream Krisp

PASTRY

(For one large pie)

2 cups pastry flour, sifted with one teaspoonful salt. Work into this, with the finger tips, a scant ½ cup Kream Krisp. Moisten to the proper consistency with cold water. It will take about ½ cup. Set away for several hours in the ice chest to become chilled. When ready to use, take half the paste and roll out to about ¼ inch thickness, then spread with about a tablespoonful of Kream Krisp (just as butter would be used to enrich the top crust). Sprinkle over a little flour, fold, and set aside until the rest of the pie is all ready. Roll out and use for top crust.

Bake in a hot oven.

The top crust may be washed over with a little milk just before putting into the oven.

USE KREAM KRISP NOT ONLY FOR DAINTY RESULTS BUT FOR ECONOMY. It will enable you to do away entirely with lard, and cut down your butter bill. Kream Krisp *with a little salt* is better than any cooking butter. For pastry, follow directions carefully and remember that you will need from ¼ to ⅓ less of Kream Krisp than if you were using butter.

KREAM KRISP

Kream Krisp
STEAMED DATE PUDDING

2 tablespoons Kream Krisp
½ cup molasses
½ " milk
1⅔ cups flour
½ teaspoon soda
¼ " salt
¼ " allspice
½ lb. dates, stoned and cut in pieces

Melt the Kream Krisp, add the molasses, milk, dry ingredients mixed and sifted, and the dates. Turn into a buttered mould, cover, and steam two hours and a half. Serve with any preferred sauce.

USE KREAM KRISP INSTEAD OF BUTTER. You can make one cake or pudding with Kream Krisp and another with butter, and nobody can tell them apart. But you will make a saving of about 60% to 80%, or even more, in the cost of shortening used. See example on page 23.

KREAM KRISP

Kream Krisp
SPICED DOUGHNUTS

1 tablespoon of melted Kream Krisp
1 cup sugar
2 eggs
⅔ cup milk
2 even teaspoons cream of tartar and 1 even teaspoon soda dissolved together in the milk
½ teaspoon salt
¼ " nutmeg
¼ " cinnamon
Flour enough to roll soft

Beat the eggs thoroughly, then, with the egg-beater, beat in the sugar gradually. Add the milk in which is dissolved the soda and cream of tartar; add the melted Kream Krisp and flour enough, with the spices sifted into it, to make a soft dough. Turn out on a baking board, roll, and cut with doughnut cutter. Fry in deep Kream Krisp till brown. Take out with a skewer and drain on brown paper. Doughnuts should come quickly to top of fat, brown on one side, then be turned to brown on the other.

USE KREAM KRISP FOR ALL DEEP FRYING. You cannot realize the delicacy and daintiness of a well-fried doughnut until you have used Kream Krisp instead of lard. Fried in Kream Krisp, the dough quickly takes on a rich brown, and absorbs much less fat than when lard or any lard compound is used.

KREAM KRISP

Kream Krisp
FRENCH FRIED POTATOES

Wash, pare, and cut potatoes in one-eighth inch strips. Soak one hour in cold water and dry thoroughly in towels. Place them in a wire basket. Heat Kream Krisp in kettle to smoking point and lower the wire basket containing potatoes into the melted fat. Hold the heat just short of the smoking point for fifteen minutes, stirring the potatoes occasionally, so that they will cook evenly. When well browned, remove in basket and drain.

COFFEE BREAD

1 cup scalded milk
1 dessertspoon Kream Krisp
1 tablespoon sugar
½ teaspoon salt
½ yeast cake dissolved in ¼ cup luke-warm water

Add shortening, sugar, and salt to the hot milk, and (when luke-warm) the yeast and about 3 cups flour. Let rise. When twice the original bulk, spread in a shallow pan and let rise again. When ready to bake wash over with cold milk and sprinkle with sugar and cinnamon. Bake in a moderate oven about half an hour.

KREAM KRISP

Kream Krisp
GRAHAM ROLLS

1 cup scalded milk
1 " water
2 dessertspoons Kream Krisp, melted in the hot milk
2 tablespoons sugar
1 teaspoon salt
1 yeast cake, dissolved in ¼ cup luke-warm water
3 cups white flour
2 " graham flour

Scald the milk and add the Kream Krisp, when entirely melted add water, salt, and sugar. Then add the dissolved yeast and flour to make a soft dough. Let rise to twice its bulk and then knead and shape into biscuits and set to rise again. Bake in a hot oven twenty minutes.

KREAM KRISP IS A NATURAL PURE FOOD PRODUCT (Guaranteed). It is nothing but a pure vegetable oil hardened to the consistance of lard by a process which positively eliminates the impurities commonly found in lard and butter, and which are always present in lard compounds. It is a better food for cooking purposes than lard or butter.

In Conclusion

Kream Krisp is a wholesome, appetizing, purely vegetable shortening, better than lard for frying, better than butter for cake and pastry, and a great money-saver for all good cooking.

See pages 22 and 23

KREAM KRISP

A Remarkable Example of Scientific Economy in the Home Kitchen

KREAM KRISP is important to the average American family because it reduces the cost of a great variety of foods cooked at home and also gives more dainty cookery, increased digestibility, and greater convenience. It also does away with the impurities common to animal products — particularly lard and dairy products.

On the opposite page you will find an actual example of a saving of 38% in the cost of a loaf of cake made with Kream Krisp, as against the same cake made with the best grade of butter. If a "pound cake" had been selected, the saving would have been considerably greater; but a fair, average cake-recipe was taken for the experiment. The Kream Krisp cake was considered by competent critics to be equal to the more costly butter cake. Note the smaller quantity of Kream Krisp used. The experiment is easy to repeat at home.

A test will convince you

The costs given ... based on the market prices current at the time of the experiment (March 16, 1915) in Boston.

KREAM KRISP

Saving 38% in the Cost of a Loaf of Cake with Kream Krisp

Ingredients	Quantity Used	Market Price	With Kream Krisp	With Butter
Eggs	2	25c. doz.	$0.0416	$0.0416
Sugar	1 cup	7c. lb.	.03	.03
Flour	1 cup	3½c. lb.	.019	.019
Baking Powder	Pineapplespoon		.0039	.0039
Milk	¼ cup	10c. qt.	.0125	.0125
Vanilla*	1 teaspoon		.025	.025
Salt	½ teaspoon		.0003	
Kream Krisp	¼ cup	16c. lb.	.0178	
Butter	½ cup	44c. lb.		.11
Cost with Kream Krisp			14½c.	
Cost with best dairy butter				24½c.
Total saving with Kream Krisp			9½c. = 38%	
Saving in cost of shortening				83%

When you realize that—

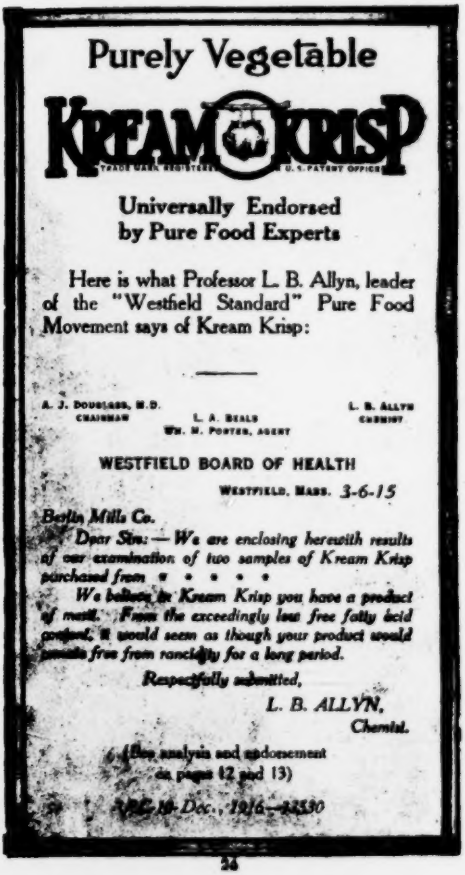
1. Butter is about the most expensive article purchased for home cooking;

2. That the butter consumed by the American family represents an annual cost of at least $40 and often $100;

3. That with Kream Krisp, used even in a delicate cake, as above, you can save over 80% in the cost of shortening, and 38% in the total cost of the cake—

Then you will understand why a high authority in food chemistry has pronounced Kream Krisp one of the most notable pure-food discoveries of the present day.

*Vanilla at 25c. per bottle holding 10 ...



Purely Vegetable

KREAM KRISP

TRADE MARK REGISTERED U. S. PATENT OFFICE

Universally Endorsed by Pure Food Experts

Here is what Professor L. B. Allyn, leader of the "Westfield Standard" Pure Food Movement says of Kream Krisp:

A. J. DOUGLASS, M.D. CHAIRMAN — L. A. BEALS — WM. H. PORTER, AGENT — L. B. ALLYN CHEMIST

WESTFIELD BOARD OF HEALTH

WESTFIELD, MASS. 3-6-15

Berlin Mills Co.

*Dear Sirs: — We are enclosing herewith results of our examination of two samples of Kream Krisp purchased from * * * * *.*

We believe Kream Krisp you have a product of merit. From the exceedingly low free fatty acid content, it would seem as though your product would remain free from rancidity for a long period.

Respectfully submitted,

L. B. ALLYN,
Chemist.

(See analysis and endorsement on pages 12 and 13)

BBC. 10-Doc., 1916—43530

26

PLAINTIFF'S EXHIBIT No. 14

[Third Edition.]

AMENDED SPECIFICATION. 808

Reprinted as amended in accordance with the decision of the Comptroller General, dated the 18th day of January, 1912.

N° 5188 A.D. 1911

(*Under International Convention.*)

Date claimed for Patent under Patents and Designs Act, 1907, being date of first Foreign Application (in Germany), 5th Aug., 1910

Date of Application (in the United Kingdom), 1st Mar., 1911

Accepted, 27th July, 1911

COMPLETE SPECIFICATION (AMENDED).

An Improvement connected with the Reduction of Fats and Unsaturated Fatty Acids.

I, Dr. Carl Paal, University Professor, of Oestliche Stadtmauerstrasse 14, Erlangen, in the German Empire, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to a process for the reduction of unsaturated fatty acids, or their glycerides into saturated compounds as claimed under Dr. Wilhelm Normann's Patent No. 1515 A.D. 1903 the said process consisting in the treatment of the fatty bodies with hydrogen in the presence of a finely divided metal adapted to act as a catalyser.

As has been shewn by C. Paal and Karl Roth (Berichte Chemischen Gesellschaft Volume XXXXI, page 2282 (year 1908); Volume XXXXII, page 1541 (year 1909)), fats and fatty acids (oleic acid) are hydrogenised by means of the colloidal palladium prepared according to the process of C. Paal and Conrad Amberger (Berichte Chemischen Gesellschaft Volume XXXVII, page 124 (year 1904); volume XXXVIII page 1398 (year 1905)), in presence of hydrogen, by which means the larger or smaller amounts of the glycerine ester of the unsaturated fatty acids contained in all animal and vegetable fats, and the glycerides of unsaturated oxy-fatty acids present in many fats (castor oil), are transformed into the glycerides of the corresponding saturated fatty acids. Analogous behaviour is exhibited by the free unsaturated fatty acids and oxy-fatty acids, these being reduced by colloidal palladium and hydrogen to the saturated acids.

The technical application of this method of Paal and Roth to the catalytic reduction of the fats and unsaturated fatty acids according to Dr. Normann's said patent is however, hindered by the high price of colloidal palladium which, after each hydrogenisation is transformed into the inactive gel form by the procedure necessary for isolating the product of the reduction. Moreover, in using this method of Paal and Roth, the fats must be converted into emulsions

[*Price* 6*d.*]

prepared by means of gum arabic, and the unsaturated fatty acids must be converted into aqueous solutions of their alkali salts. In order to reduce large quantities of these substances, very large volumes of liquid are therefore required. The recovery of the valuable gum arabic is also a tedious and expensive process. If attempts be made to replace gum arabic by other, cheaper, emulsifying agents—for example, solutions of soap or of saponin—the fatty emulsions thereby obtained are not reduced by palladium sol and hydrogen.

I have now discovered means whereby all the above mentioned circumstances that hinder the industrial application of the method of Paal and Roth are obviated. The process is based on the use of finely divided palladium or hydroxide of same, precipitated by the wet method on inert substances, devoid of anticatalytic action. For instance, use may be made of palladium obtained by the action of aqueous solutions of palladium salts upon aqueous suspensions of finely divided metals (for instance magnesium, nickel or cobalt) that have no anticatalytic action. Use may also be made of the product of the action of palladium salts, in solution, upon aqueous suspensions, of finely divided metallic oxides of metallic carbonates, that are insoluble in water, in some cases after reduction treatment. Usable reducing agents can also be obtained by bringing an aqueous solution of an inorganic salt and palladium salt into action with an aqueous solution of a second inorganic salt capable of reacting on the first inorganic salt, with or without the addition of a reducing agent. Inert substances that are insoluble in water and have no anticatalytic action, may also be impregnated with a solution of a salt of palladium, then treated with soda solution, and thereafter reduced if necessary.

The following method may be adopted in the preparation of the catalysers according to this invention.

1. When Metals are used as the Vehicle or Carrier.

100 parts of powdered nickel or magnesium are suspended in 1000 parts of water, and treated with a solution of 0.9 parts of palladium dichloride $PdCl_2$ (equivalent to 0.5 part of Pd), in 50 parts of water. Palladium is precipitated on the powdered metal, whilst a quantity of the metal equivalent to the $PdCl_2$ consumed passes into solution as chloride.

2. When Oxides or Carbonates are used as the Vehicle or Carrier.

100 parts of precipitated magnesium oxide, magnesium carbonate or calcium carbonate are suspended in 500 parts of water and digested with an aqueous solution (containing a minimum of free hydrochloric acid) of 1.7 parts of palladium dichloride $PdCl_2$ (=1 part of Pd) in 400 parts of water. Palladium proto-hydroxide is precipitated on the oxide or carbonate in excess. After washing with water, the products are dried at a gentle heat, below 100° C.

3. When Inert Substances are used as the Vehicle or Carrier.

100 parts of calcined kieselguhr or purified wood meal are stirred up with a solution of 3.4 parts $PdCl_2$ (=2 parts of Pd) in 500 parts of water, and digested with 800 parts of a warm 2% solution of sodium carbonate or of sodium hydrate or caustic soda.

If 100 parts of barium sulphate, very finely powdered talc or powdered carbon be used, they are preferably stirred with an aqueous solution of 1.7 parts of $PdCl_2$ (=1 part of Pd),—40 or 70 parts of water being used, the mixture being then digested with 400 parts of warm solution of sodium carbonate or of sodium hydrate or caustic soda containing 2%.

After precipitation is completed, the substances are washed with water, filtered, and the residue dried at the lowest possible temperature.

If it be desired to prepare the said materials with the element palladium in place of the palladium proto-hydroxide, then a suitable reducing agent is added

to the soda solution, for example, hydroxylamine chloride or hydrazine chloride in slight excess, the further treatment being as already described.

The reduction of fats and unsaturated fatty acids according to Dr. Normann's said process when these catalysers are used may be carried out as follows. The above described palladiferous hydrogen-carriers are mixed with the fluid or warmed and liquefied fat or with the unsaturated fatty acids, and the mixture exposed to hydrogen—preferably out of contact with air, and assisted by stirring and also, if required, by pressure and heat—so long as absorption of hydrogen continues. The product of the reaction is then, for instance, by means of suitable filtering devices, separated from the hydrogen carrier, which can then be used over again without further treatment.

The duration of the reduction depends not only on the presence of larger or smaller quantities of glycerides of highly unsaturated fatty acids in the fats (fats with high iodine value), but also on the special nature of the fats.

The velocity of the reduction also depends on the amount of the catalysers and on the pressure, as well as on the temperature at which the action of the hydrogen is exerted. One part of palladium, used in the form of the above described preparations, is sufficient to transform a thousand parts of fat or unsaturated fatty acid into hard, brittle masses in a few hours.

When it is desired to effect the reduction in the shortest possible time, the hydrogen may be preferably used under a pressure of 2 to 3 atmospheres. Nevertheless, the reduction will proceed in a satisfactory manner, even without pressure.

The temperature is preferably maintained at a level slightly above the solidification point of the product of the reaction.

Anticatalytics, which more or less completely deprive palladium of its function as carriers of hydrogen, such for instance as arsenic and its compounds, phosphoretted hydrogen, sulphuretted hydrogen, free mineral acids, and also liquid hydrocarbons, chloroform, acetone and carbon disulphide, should be avoided.

After being used once for reduction purposes, the activity of the catalysers containing palladium proto-hydroxide is considerably increased.

EXAMPLES:

1. THE REDUCTION OF FATS.

1000 kilos. of castor oil are mixed with 1 kilo. of a catalyser containing 1 *per cent.* of palladium in the form of metal or proto-hydroxide, and this mixture of fat and catalyser is placed in an hermetically closed autoclave. The air in the autoclave is then exhausted as completely as possible, and hydrogen is admitted under a pressure of 2 to 3 atmospheres, the stirring apparatus is set going, and the autoclave is heated to about 80°. The progress of the reduction, indicated by the consumption of hydrogen, can be followed by reading the diminution of pressure on the pressure gauge.

If the gauge pressure continues to decrease, more hydrogen is admitted. The completion of the process can be recognised by the gas pressure remaining constant for some considerable time. When the reduction process is ended, the product of the reduction is separated from the catalyser in a filter press which is adapted to be heated. The catalyser can then be used again.

By means of the above described process of reduction, fats of all kinds, both of animal and vegetable origin, can be hydrogenised. The reduction products form hard, tallowy or brittle, pulverisable masses.

The reduction process may also, of course, be carried on in such a manner that only partial reduction ensues. These partially reduced fats then exhibit a lowered melting point and a consistency resembling ointment.

The degree of hydrogenisation can be determined by ascertaining the iodine value.

Improvement connected with the Reduction of Fats and Unsaturated Fatty Acids.

2. The Reduction of Unsaturated Fatty Acids.

The reduction is performed in exactly the same manner as described above for the fats. The catalysers preferably used are only such palladiferous hydrogen-carriers as are not attacked by the acids in the process itself. For instance, use may be made of the preparation obtained from a mixture of barium chloride and palladium dichloride, by displacement with sodium sulphate in presence of alkaline hydroxylamine or hydrazine. Palladium, or its proto-hydroxide, precipitated on calcium carbonate, kieselguhr or wood meal, is also suitable. By means of this reduction process the various unsaturated fatty acids and fatty-acid mixtures, such as are obtained by the saponification of all kinds of fats, for instance, technical oleic acid, ricinoleic acid, linoleic acid, the acids of soja bean oil, the acids of fish oils, *etc.* can be hydrogenised, and thereby transformed into the solid, saturated fatty acids or fatty-acid mixtures.

1000 kilos. of oleic acid are mixed with .1 kilo. of a catalyser containing 1% of palladium, in the form of metal or proto-hydroxide, and this mixture of fatty acid and catalyser is hermetically sealed in an autoclave, the process being, in other respects, the same as given under 1.

It sometimes happens that, as a result of the stirring during the reduction process, particles of the catalyser vehicle, and also small quantities of palladium get into the reduced fat or fatty acids, in such a fine state of division that these extremely fine particles are not retained by the filter. In such cases the reduction product is warmed (for instance with a little dilute hydrochloric acid in which a small quantity of alumina has been dissolved) for a short time with powerful stirring. The powerful electrolytes, aluminium chloride and hydrochloric acid, effect the agglomeration of the finely divided particles in the fat, and the hydrochloric acid at the same time dissolves the greater portion of the flocculated palladium. By washing the solidified reduction product with water, and then filtering the said product after melting same, the flocculated particles are separated therefrom, and in this way the reduced fat or fatty acid, on the one hand, is purified, whilst on the other hand the valuable palladium that has been partially flocculated and partially dissolved in the hydrochloric solution, is recovered.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is:—

In the aforesaid process for the reduction of fats and unsaturated fatty acids, the employment of palladium, or palladium hydroxide, that has been precipitated on inert substances by the wet method.

Dated this 1st day of March, 1911.

PHILIP M. JUSTICE,
Chartered Patent Agent,
London,
For the Applicant.

Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.
[Wt. 3.—50/1/1916.]

PLAINTIFF'S EXHIBIT No. 15

812

N° 9112.—A.D. 1908.

Improvements in and relating to the Reduction of Organic Substances.

The invention is not confined to the use of any particular form of tower or reducing chamber, so long as it is capable of carrying out the process described and is also capable of being placed under vacuum or low pressure.

Dated this 27th day of April 1908.

MARKS & CLERK,
18, Southampton Buildings, London, W.C.,
13, Temple Street, Birmingham, and
30, Cross Street, Manchester,
Agents.

COMPLETE SPECIFICATION.

"Improvements in and relating to the Reduction of Organic Substances."

We, FRED BEDFORD, Ph.D., B.Sc. (London), of Sleaford, and CHARLES EDWARD WILLIAMS, of Thornhayes, Sleaford, in the County of Lincoln, Seed Crusher, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to the reduction of organic substances such as organic unsaturated fluids and solids when converting them into saturated compounds, for instance, the conversion of unsaturated fatty acids or their esters into saturated acids or their esters, respectively, or the reduction of nitro-bodies, such for instance, nitro-benzole and ketones, for example benzo-phenone.

The invention has special reference to the process described in Specification No. 2520 of 1907, the object of the present invention being to increase the yield of reduced substance and to ensure a thorough bleaching of the latter.

According to the present invention the tower or vessel in which the reduction occurs is placed under vacuum or connected with a suitable vacuum chamber.

The accompanying diagram illustrates in section one form of apparatus which may be employed.

In carrying out the invention according to one mode, a tower, *a*, is partly filled with nickel coated pumice-stone, *b*, prepared for instance, in the manner described in the before mentioned specification and supported on grids, *c*. At a suitable point, somewhat near the bottom of this tower, the substance to be reduced is introduced in a form of spray, for instance, it is preferably sprayed in a liquid form by means of hydrogen, the spray nozzle, rose, or other device, *d*, being connected with a vessel containing the substance in a liquid form and which is forced out of the vessel by means of hydrogen under pressure. The upper part of the tower, *a*, is connected by a pipe or conduit, *e*, to a receiving vessel, *f*, in which a partial vacuum is maintained by means of a vacuum pump. A cooler such as a coil, *g*, in a water tank, *h*, is preferably interposed between the receiver *f* and the tower *a*. The connection from the vacuum pump to the vacuum or receiving vessel *f* is adapted to prevent as much as possible the passage of reduced substance to the pump, traps, or any other devices being interposed for this purpose.

Hydrogen is introduced through a perforated ring *i*, or the like at the bottom part of the tower, *a*, a shield, *k*, being provided if required to prevent

813

N° 9112.—A.D. 1908. 3

Improvements in and relating to the Reduction of Organic Substances.

choking of the holes in the ring *i*, should the apparatus be allowed to stand.

It is found in practice that according to this improved method or process not only is the yield of reduced substance greatly increased, but that the substance is more thoroughly bleached than when a process of reduction is carried on at or above atmospheric pressure. By connecting the tower to the vacuum chamber the substance to be reduced, when it is sprayed upon the nickel coated compound or other catalytic substance and simultaneously meets the hydrogen introduced in any suitable manner, is not only reduced as described in the before mentioned specification but vapourises and being dispersed as a vapour throughout the tower comes into contact with the catalytic substance and hydrogen therein and passes off to the vacuum chamber or receiver. The tendency for the reduced substance to remain upon the catalytic substance, and to thereby decrease the available effective area, is avoided, so that the yield from a certain plant per unit of time is greatly increased.

The best results are obtained by first spraying the substance to be reduced on to the catalytic substance at the ordinary pressure, for instance at or about atmospheric pressure, and when a certain quantity has been sprayed, putting the apparatus, at the same temperature, under vacuum and drawing off the reduced substance. When no more substance collects in the receiver, more substance is sprayed on to the catalytic substance and so on.

It is obvious that several towers or reducing plants can be connected up to one common vacuum or receiving chamber.

The invention is not confined to the use of any particular form of tower or reducing chamber, so long as it is capable of carrying out the process described and is also capable of being placed under vacuum or low pressure.

Having now particularly described and ascertained the nature of our said invention, and in what manner the same is to be performed, we declare that what we claim is:—

1. In the process for reducing substances, described in Specification No. 2520 of 1907, placing the vessel in which the reduction occurs under reduced pressure, substantially as and for the purpose hereinbefore set forth.

2. In the process for reducing organic substances, described in Specification No. 2520 of 1907, distilling off the substance obtained by reduction with hydrogen in the presence of a catalytically active body, immediately after its formation, and under reduced pressure, substantially as hereinbefore set forth.

3. The improved process for reducing organic substances hereinbefore described.

Dated this 27th day of October, 1908.

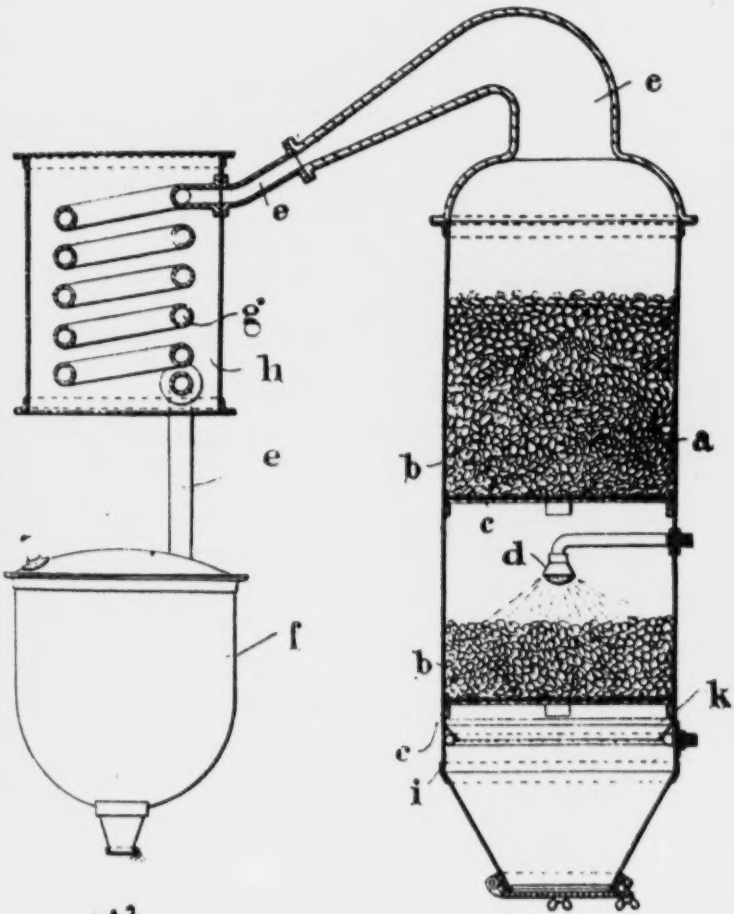
MARKS & CLERK,
18, Southampton Buildings, London, W.C.,
13, Temple Street, Birmingham, and
30, Cross Street, Manchester,
Agents.

Here follows 2 diagram marked p. 814

814

A.D. 1908. April 27. N° 9112.

BEDFORD & another's Complete Specification. 1 SHEET.



433
Berlin Mills Co
v
Procter & Gamble Co.
} Ph 814

[This Drawing is to the same reduction as the original.]

815

815.-RECEIVED
NOV. 10 1910
CHIEF CLERK U.S. PATENT OFFICE

Papers No. 1
Nov 12 1910
Division 6

TO THE COMMISSIONER OF PATENTS:

Your petitioner, John J. Burchenal, a citizen of the United States, and a resident of the City of Cincinnati, in the county of Hamilton and State of Ohio, whose Post office address is the southeast corner of Fourth and Main Street, Cincinnati, Ohio, prays that letters patent may be granted to him for the improvements in Food Products, set forth in the annexed specification; and he hereby appoints Alfred M. Allen, of Cincinnati, Ohio, his attorney, with full power of substitution and revocation, to prosecute this application, to make alterations and amendments therein, to receive the patent, and to transact all business in the Patent Office connected therewith.

Signed at Cincinnati, in the county of Hamilton and State of Ohio, this 31st day of October, 1910.

John J. Burchenal

Cls. 3-4

816

TO ALL WHOM IT MAY CONCERN:

Be it known that I, John J. Burchenal, a citizen of the United States, and a resident of the City of Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful improvements in Food Products, of which the following is a specification.

This invention is a food product consisting of a vegetable oil, preferably cotton-seed oil, partially hydrogenized and hardened to a homogeneous white or yellowish semi-solid closely simulating lard.

In manufacturing this product, cotton-seed or other vegetable oil is caused to chemically absorb a limited amount of hydrogen by reacting on the oil with hydrogen in the presence of a catalytic agent and at an elevated temperature. The oil is preferably agitated in a closed vessel in the presence of an atmosphere of compressed hydrogen, a catalyser of finely-divided nickel carried by kieselguhr being maintained in suspension in the oil and its temperature being raised to about 155° C.

According to the present invention, the amount of hydrogen absorbed is carefully regulated and limited. In practice, the operation is stopped when the oil has been converted into a product which ~~having a melting point ranging from 34° C. to 43° C., preferably 41-43° C. This product~~ cools to a white or yellowish semi-solid more closely resembling lard than do the commercial mixtures of cotton-seed oil and animal oleo-stearin.

817

Sub A'

~~The new product has a saponification value of about 195, an iodine value ranging from about 55 to 60, and a titer of from about 35.5°C. to 42.5°C.~~ While but partially hydrogenized, containing from about 1.5% to 2.5% of additional hydrogen more than in the nonhydrogenized material, it shows no free cotton-seed oil when subjected to the Halphen test, thereby differing from all commercial lard substitutes containing this oil.

Insert C3

While the finished article is preferably the homogeneous product of incomplete hydrogenation, a compound lard substitute may be made by causing the oil to absorb a larger amount of hydrogen, still short of saturation, and mixing the hard product with raw oil. For example, the reaction may be caused to proceed far enough to produce a hydrogenized product having a melting point of 50°C., and equal parts of this product and of raw oil may then be mixed to give an article of the desired consistency.

Insert C4 per D

I claim:

Insert C5 per E

3 %. A lard-like food product, consisting of an incompletely-hydrogenized vegetable oil, said product being a semi-solid having an iodine value ranging from 55 to 60 a melting point ranging from 36° to 43° C.

" per F

4 %. A lard-like food product, consisting of incompletely-hydrogenized cotton-seed oil, said product being a white or yellowish semi-solid, having, approximately, a melting point of 36° to 43°C., a saponification value of 195, an iodine value of 55 to 80, and a titer of 35.5° to 42.5°C., giving no reaction for cotton-seed oil under the Halphen test.

Insert C6 per C

Insert C7 per B

ATTEST:

H. C. French

P. B. Hedd

John J. Burchenal

STATE OF OHIO)
) SS:
COUNTY OF HAMILTON)

John J. Burchenal,

the above named petitioner, being sworn, deposes and says that he is a citizen of the United States, and a resident of Cincinnati, in the county of Hamilton and State of Ohio; that he verily believes himself to be the original, first and sole inventor of the improvements in Food Products, described and claimed in the annexed specification; that he does not know and does not believe that the same were ever known or used before his invention or discovery thereof, or patented or described in any printed publication in any country before his invention or discovery thereof, or more than two years prior to this application, or in public use or on sale in the United States for more than two years prior to this application; that said invention has not been patented in any country foreign to the United States on an application filed by him or his legal representatives or assigns more than twelve months prior to this application; and that no application for patent on said improvements has been filed by him or his representatives or assigns in any country foreign to the United States.

John J. Burchenal

Sworn to and subscribed before me this 31st day of October, 1910.

Guy B. Taylor
Notary Public in and for
Hamilton County, Ohio.

SEAL

819

APPLICATION ROOM
Nov 16 1910
U.S. PATENT OFFICE

Paper No. 2
Nov 19 1910
Division 6
Assoc. Power of Att'y.

Cincinnati, Ohio, November 14,1910

Commissioner of Patents,

Washington, D. C.

Dear Sir:-

I hereby appoint Messrs. Byrnes, Townsend and Brickenstein, a firm composed of E. A. Byrnes, C. P. Townsend and J. H. Brickenstein, all of Washington, D. C., my associate attorneys in the matter of the application of John J. Burchenal, for patent for Food Products, filed November 10, 1910, Serial Number 591,726.

Yours truly,

Alfred M. Allen
Attorney for John J. Burchenal

820

APPLICATION ROOM
NOV 16 1910
U.S. PATENT OFFICE

Paper No. 3
Nov 19 1910
Division 6
Appearance

Application of
John J. Burchenal,
for patent for
Food Products,
filed Nov. 10, 1910,
Ser. #591,726

Washington, D. C., Nov. 15, 1910.

Hon. Commissioner of Patents,

Sir:-

Please enter our appearance as attorneys in this case, being members of the firm of BYRNES, TOWNSEND & BRICKENSTEIN, of 918 F St., N. W., Washington, D. C., Register No. 8562.

Respectfully,

E A Byrnes

C P Townsend

J H Brickenstein

EPL

821

APPLICATION ROOM
NOV 26 1910
U.S. PATENT OFFICE

A

Paper No. 4
Nov 28 1910
Division 6

John J. Burchenal,

Filed Nov. 10, 1910, Ser. No. 591726

"Food Products."

Washington, D.C., Nov. 25, 1910,

Hon. Commissioner of Patents,

Sir:-

Amendment is made by adding the following claim:

3. A semi-solid ~~hydrogenized~~ oil

Respectfully,

BYRNES, TOWNSEND & BRICKENSTEIN,
Attys.,

By E A Byrnes

822

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
Washington Dec. 13, 1910.
MAILED " " "

John J. Burchenal,

Care Alfred M. Allen,

304 Bell Block,

Cincinnati, Ohio.

Please find below a communication from the EXAMINER in charge of your application, of No. 591,726, Food Products, Filed Nov. 10, 1910

E. B. MOORE
Commissioner of Patents

The composition of lard and of cotton seed oil as to the glycerins olein and stearin that they contain is well known. To make a product from cotton seed oil that shall simulate lard the content of stearin should be increased. Also the process of hydrogenizing oils high in oleic acid is well known as is shown in the patent to Schwoerer 902,177 Oct. 27, 1908 Class 87-12 (Transformation) and the German patents to Herforder Maschinenfett & Co. 141,029, Ausgegeben May 4, 1903 and to Erdmann 211,669 Ausgegeban July 13, 1909 both in the same class. It is thought therefore that if the problem of simulating lard from cotton seed oil were presented to an oil chemist, an incomplete hydrogenization of the cotton seed oil would at once suggest itself to him as a solution of the problem. All the claims are accordingly rejected on the above ground of lack of invention.

Claim 3 is further rejected on the product formed by the above cited patents.

Ely
Examiner

W.W.H.

823

APPLICATION ROOM
DEC 13 1911
U.S.PATENT OFFICE

U.S. Patent Office Serial No. 591,726

Room 169.

Received
Dec 14 1911
Division 31, Paper No. 6

John J. Burchenal,

Filed Nov. 10, 1910

Ser. No. 591,726

"Food Products."

Washington, D. C., Dec. 12, 1911.

Hon. Commissioner of Patents,

Sir:

Replying to the official communication dated Dec. 13, 1910: Amendment is made by canceling claim 3.

Applicant is quite familiar with the prior patents cited.

The Schweerer patent describes an apparatus for converting oleic into stearic acid and candle-material, by the action of hydrogen and a catalyzer.

The Herforder Company patent describes a method of converting unsaturated fatty acids into saturated ones, e.g., stearic acid, by the action of hydrogen and a catalyzer, and refers to the treatment of olive-, linseed- and fish-oils.

The Erdmann patent describes a method of quantitatively converting oleic, and also linolic and linoleic acids, into stearic acid; also of converting fusible tallow into harder tallow.

Neither of these patents is directed to or suggests the production of an artificial product simulating lard. Nothwithstanding the fact that "the problem of simulating lard from cotton-seed oil" has long been "presented to an oil chemist", and has been the subject of many researches, the present invention, so far as known, has never suggested itself to the skilled workers in this line. Many lard substitutes have been devised, patented and marketed, in which cotton-seed oil is an essential component. Applicant does not allege that his product is identical with lard, for it

may be and probably is impossible to artificially reproduce lard. He has invented a new substitute for lard of great utility and commercial importance, and it is submitted that he is entitled to a patent therefor. Prior inventors have attempted to solve one problem, that of producing a completely saturated fatty acid from an unsaturated acid, endeavoring and claiming to make the operation quantitative. Applicant appears to be the first to determine and set forth the advantages and properties of a fractionally-hydrogenized product, and his claims do not even cover such product broadly but are limited to a product having a definite degree of partial hydrogenization, giving it definite physical and chemical characteristics specified in the claims. It is noted that the present Examiner has heretofore granted patents for products the novelty of which depends on their simulating, although not reproducing, animal fats. Attention is called, for example to U. S. patent 782,820 to Blum.

Reconsideration is requested.

Respectfully,

JOHN J. BURCHENAL,

By Byrnes Townsend & Brickenstein,
Attys.

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
Washington Dec. 29, 1911.
MAILED " " "

John J. Burchenal,

Care, Byrnes, Townsend & Brickenstein,

Washington, D. C.

Please find below a communication from the EXAMINER in charge of your application No. 591,726, Food Products, filed Nov. 10, 1910.

E. B. MOORE
Commissioner of Patents

This case has been reconsidered in view of the amendment of Dec. 18, 1911.

Since the last office action the patents to Kayser 1,004,035, Sep. 26, 1911, and 1,008,474, Nov. 14, 1911 (87-12, Transformation) have been issued. These patents are adapted to hydrogenize glycerides and the latter one specifically mentions its adaptability for cotton seed oil. In view of the fact that the process could be arrested at any time during its progress and thus an incompletely hydrogenized article be produced, and in view of the fact that the physical constants given as to the product in claim 2 are not seen to define anything critical or decisive, the claims are rejected as defining nothing patentable over the above patents.

W.W.H.

Ely
Examiner

APPLICATION ROOM
NOV 20,1912
U.S.PATENT OFFICE

U.S. Patent Office Serial No. 591,726

Room 169

Received
Nov 21 1912 C
Division 31, Paper No. 8

John J. Burchenal,

Filed November 10, 1910,

Ser. No. 591,726,

"Food Products."

Washington, D.C., November 20, 1912.

Hon. Commissioner of Patents,

Sir:-

Replying to the official communication of December 29, 1911:

Amendment is made as follows:

Page 1, after the second paragraph ending "simulating lard", insert:

"The special object of the invention is to provide a new food product for a shortening in cooking, in which the liability to become rancid is minimized, and in which the components of such vegetable oils which are inferior and detrimental to use as such a food product have been to a large extent converted into a higher and more wholesome form.

All such vegetable oils contain glycerids of unsaturated fatty acids, and among these, notable quantities of fatty glycerids of lower saturation than olein. It is the presence of these glycerids of lower saturation that seriously affects the rancidity of the material. Oxidation is largely the cause of rancidity, which oxidation weakens the fact at the point of absorption at the double bonds, and these glycerids of lesser saturation readily absorb oxygen from the air at ordinary temperatures, while the more highly saturated glycerids, as olein, only absorb oxygen at elevated temperatures. It is evident, therefore, that oils or fats containing notable quantities of glycerids of linolic acid, or of lesser saturation, are distinctly inferior as an edible product to those containing a minimum of these glycerids with a larger per cent. of olein.

Cls 1-2, 5-9

On the other hand, while it is important to get rid of the readily oxidizable glycerids of lower saturation, it is also important not to supply too large a per cent of fully saturated glycerids. The saturated glycerids of the arachidic, stearic, palmitic and other groups are of very small value for shortening, inasmuch as it is the liquid fats which contribute this value to the material. Saturated fats, however, serve the purpose of concealing the shortening within the food, and thus retain it equally distributed throughout the whole. Oil, liquid at the ordinary temperatures, does not make the best shortening, because the oil remains liquid, keeping the food in a soggy condition, and the oil will even settle to the under part of the cooked product and soil the cloth, paper, or whatever it may come in contact with.

Moreover, fats of a melting point above the temperature of the human body, 98°F., are not so digestible as fats which are liquid at this point, or which have a melting point below 98°F.

It is, therefore, my object in the preparation of my new, ~~butter-like~~ lard-like food-product, composition and/ and in preparing same from cottonseed oil, to change the chemical composition of the oil to obtain a product with a high percentage of olein, a low percentage of linolin and the lesser-saturated fats, and with only sufficient stearin to make the product congeal at ordinary temperatures, ~~but below the heat of the blood.~~"

✓Page 1 last line, after "oleo-stearine", cancel the period and add:

", while in many respects the product is superior to the best leaf lard as a shortening. It is not so liable to become rancid and the product can be heated to a considerably higher temperature than lard without smoking or burning. The high

temperature to which my product can be raised without smoking or burning makes the product ideal for frying, inasmuch as a crust forms almost instantly on the food fried, which prevents any absorption of the shortening."

✓ Page 2, line 7, after "oils", insert:

"It contains from twenty to twenty-five per cent of fully saturated glycerids, from five to ten per cent linolin and from sixty-five to seventy-five per cent olein, and an average of a number of samples gives twenty-three per cent of saturated fats, seven and five-tenths per cent linolin and sixty-nine and five-tenths per cent olein, while the cottonseed oil before treatment contained seventeen per cent saturated fats, thirty-seven per cent linolin and forty-six per cent olein.

It will thus be seen that we have produced an ideal food product, which is high in olein, low in linolin and lesser-saturated fats, and with only enough stearin to make the product congeal at ordinary temperatures, ~~but below the heat of the blood.~~"

✓ Claim 2, line 3, change "40° to 41°C." to "36° to 43° C."; ✓ line 4, cancel "a saponification value of 195",

✓ Insert the following claims:

1. A ~~butter~~ lard-like composition comprising edible hydrogenized fatty oil.

2. A ~~butter~~ lard-like composition comprising edible hydrogenized vegetable oil.

Renumber original claims 1, 2 as 3,4, and add:

5. A food product, composed of glycerids of saturated and unsaturated fatty acids in substantially the proportions of from twenty to twenty-five per cent of saturated fats, five to ten per cent of fats of lesser saturation than olein, and sixty-five to seventy-five per cent of fats of a saturation corresponding to that olein.

6. A food product, composed of glycerids of saturated and unsaturated fatty acids in substantially the proportions of from twenty to twenty-five per cent of stearin, five to ten per cent of linolin, and sixty-five to seventy-five per cent of olein.

7. A food product, composed of glycerids of saturated and unsaturated fatty acids in substantially the proportions of twenty-three per cent of stearin, seven and five-tenths per cent of linolin, and sixty-nine and five-tenths per cent olein.

R E M A R K S

Since the rejection of applicant's claims on patents to Kayser, a patent has issued to Carleton Ellis, No. 1,038,545, dated September 17, 1912, on an application filed May 31, 1912, broadly claiming the subject-matter presented herein. Applicant has inserted claims 7, 8 of said Ellis patent as claims 1 and 2 of the present amendment, and respectfully requests allowance and the declaration of an interference with said patent.

JOHN J. BURCHENAL,

By Byrnes Townsend & Brickenstein
Asso. Attys.

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
Washington Dec. 6, 1912.
MAILED " " "

J. J. Burchenal,

c/o Byrnes, Townsend & Brickenstein,

City.

Please find below a communication from the EXAMINER in charge of your application #691,726, filed Nov. 10, 1910, for "Food Products."

E. B. Moore
Commissioner of Patents

Replying to your communication of Nov. 20, 1912.

This application has been transferred to Div. 6.

After careful consideration it is the opinion of the examiner that there is no basis in this application for new claims 1 and 2 which are claims 7 and 8 of patent No. 1,038,545 granted to Ellis and an interference with that patent is accordingly refused. The expression "butter-like" has a much more definite meaning in the Ellis patent than applicant is giving it. It means that the product is like butter, not merely that it has the consistency of butter. The title of Ellis patent, refers to it as a "butter substitute." That is something different from a lard substitute which applicant's compound is. It is true that butter is used in cooking like lard is but that does not make lard a butter substitute since the usual and principal use of butter is as a table food, a use to which lard is not put. One of the essentials of butter or butter substitutes is that they have a melting point considerably less than the temperature of the human body so that, when taken into the mouth they immediately melt and do not leave a greasy sensation of the tongue and walls of the mouth. This is one of the requirementsof his product pointed out by Ellis, lines 46 to 52 page 1, and then he proceeds to describe how a product having

this property of butter as well as other properties such as taste may be produced. Applicant's product fails to meet this melting point requisite of a butter substitute since the minimum melting point stated is 36° C, about 97°F, which is not "considerably below" the temperature of the human body, and not low enough to melt in the mouth. The preferable melting point of applicant's product is stated to be 41° to 42° C (page 1 lines 22-23) which temperatures are much above the normal human body temperature. A careful reading of applicant's specification and claims as originally filed fails to disclose any hint that the product had properties which made it "butter-like" or that applicant had any such thing in mind. On the other hand it is clearly indicated that the product is like lard "closely simulates lard" (line 11 page 1) and is a lard substitute. A reading however of the specification of the Ellis patent clearly indicates that the product described therein is one to be used in the place of butter, for all the purposes to which butter is usually put, not merely that it is a substitute for butter as a material to be used in cooling. The term "butter-like" in the claims of the Ellis patent is a definite term, open apparently to no criticism as to meaning; and clearly not ambiguous or indefinite in the least degree when read in connection with the specification of the patent. They can mean but one thing, that the compound is like butter can be used as butter can, is a butter substitute, which applicant's product is not, and since applicant can not therefore use the words in the same sense as they are used in the Ellis patent he cannot make the claims and get an interference therewith. Claims 1 and 2 are accordingly rejected as covering new matter.

and all reference in the amendatory matter to applicant's product being butter-like, such as the last paragraph of the first insert on page 1 must be stricken out.

It is noted that applicant has inserted on page 2 in line 7 a paragraph stating the alleged composition of his product and that claims 5, 6 and 7 are based thereon. The composition was not originally given and the examiner has no means of determining that the compound having the properties set forth in the last paragraph of page 1 and the first paragraph of page 2 would necessarily have the composition set forth in the amendment. The only ground upon which the statement of the composition can now be inserted is that the compound having the properties as set forth in the case as filed must have the composition alleged, and proof of this in the form of a proper affidavit must be filed.

Applicant has not pointed out wherein the rejection of claims 3 and 4 former 1 and 2, especially upon the Kayser patent, 1,008,474, is not a proper one and such rejection is repeated. Attention is called to line 15 page 1 and lines 95 to 102 page 2 of said patent.

Claims 5, 6 and 7 if they have basis under the original disclosure, appear to be allowable.

A M Lewers

Examiner, Div. 6

APPLICATION ROOM
JAN 10 1913
U.S. PATENT OFFICE

Paper No. 10
Jan 11 1913
Division

Div. 6, Room 318.

J. J. Burchenal,

Ser. No. 591,726,

Filed November 10, 1910,

"Food-Products."

Washington, D. C., January 9, 1913.

Hon. Commissioner of Patents,

Sir:-

In view of Office action of December 6, 1912, amendment is made as follows:-

In the last paragraph of the insertion entered on page 1, after paragraph 2 thereof, by amendment of November 20, 1912, line 2 of said paragraph; also in claims 1, 2, line 1 of each, change "butter-like" to "lard-like."

Claims 3, 4, line 1 of each, before "food" insert "lard-like".

REMARKS.

The product originally described, having the melting-point, titer and iodine value specified in original claim 2, has the chemical composition set forth in claims 5, 6, 7. Applicant's supplemental oath to this effect will be filed.

The product of claims 3, 4, original 1, 2, is not anticipated by the references cited, which do not describe a lard-like food-product, a semi-solid having a melting point ranging from 36° to 43° C.

Allowance is requested.

Respectfully,

J. J. BURCHENAL

By Byrnes Townsend & Brickenstein
Assc. Attys.

DEPARTMENT OF THE INTERIOR
United STATES PATENT OFFICE
Washington Feb. 15, 1913
MAILED " " "

Byrnes, Townsend & Brickenstein,

918 F St.

City.

Please find below a communication from the EXAMINER in charge of the application of J. J. Burchenal, Serial No. 591,726, filed Nov. 10, 1910, for Food Products.

E. B. Moore,
Commissioner of Patents

Replying to your communication of Jan. 10, 1913.

The supplemental oath which applicant states will be filed if desired should be filed.

Otherwise the case appears to be allowable.

A M Lewers

Examiner, Div. 6

APPLICATION ROOM
MAR 17 1913 1
U.S. PATENT OFFICE

E Paper No. 12
and Suppl Oath Mar 18 1913
Division 6

HAB.HPL

Room 314,

John J. Burchenal,

"Food Products,"

Filed November 10, 1910

Ser. No. 591,726

Washington, D. C., March 17, 1913.

Hon. Commissioner of Patents,

Sir:-

Replying to the official communication of February 15, 1913:

Amendment is made as follows:

✓Claim 3, line 2, cancel "a melting-point ranging from 36° to 43° C." and substitute "an iodine value ranging from 55 to 60°".

REMARKS.

A supplemental oath is filed herewith, as requested.

In view of the fact that these products have no sharp or definite melting point, and in view of the wide variety of melting-point methods employed by chemists and the different values obtained thereby, claim 3 has been amended to specify the range of iodine values of applicant's products, rather than their melting-point range.

Allowance is requested.

Respectfully,

JOHN J. BURCHENAL,

By Byrnes Townsend & Brickenstein
Asso. Attys.

APPLICATION ROOM
MAR 17 1913 1
U.S. PATENT OFFICE

SUPPLEMENTAL OATH.

State of Ohio,)
(SS:
County of Hamilton.)

John J. Burchenal, whose application for letters patent for an improvement in Food Products, Serial No. 591,726, was filed in the United States Patent Office on the 10th day of November, 1910, being duly sworn, deposes and says that the subject matter as set forth in his amendment dated Washington, D. C., November 20th, 1912, specifies and describes the invention of the food product as set forth in the original application; that the same was invented before he filed his original application for said invention; was not known or used before his invention; was not patented or described in any printed publication in any country more than two years before his application; was not patented in a foreign country on an application filed more than twelve months before his application; was not in public use or on sale in this country for more than two years before the date of his application, and has not been abandoned.

John J. Burchenal

Sworn to and subscribed before me this 24th day of February, 1913.

Guy B. Taylor
Notary Public in and for
Hamilton County, Ohio.

(SEAL)

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
Washington
MAILED May 27, 1913

Byrnes, Townsend & Brickenstein,

Wash., D. C.

Please find below a communication from the EXAMINER in charge of the application of J. J. Burchenal, Serial No. 591,726, filed Nov. 10, 1910, for Food Products.

E. B. Moore
Commissioner of Patents

Replying to your communication of March 17, 1913.

Since claims 1 and 2 are not patentable over the issue in interference No. 35,643 involving a companion application of applicant further action upon the merits of these claims is suspended until the termination of the interference. (Ex parte McCormick, 113 O. G., 2508).

A M Lewers

Examiner, Div. 6

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
Washington Jan. 22, 1915
MAILED " " "

Byrnes, Townsend & Brickenstein,

Washington, D. C.

Please find below a communication from the EXAMINER in charge of the application of J. J. Burchenal, Serial No. 591,726, filed Nov. 10, 1910, for Food Products.

Thomas Ewing
Commissioner of Patents

Interference No. 35643 having terminated this case is again taken up for consideration.

It is noted that the oath filed March 19, 1913 is the ordinary supplemental oath and does not cover the facts which it was stated in applicant's communication Jan. 10, 1913 it would cover nor does it comply with the requirements of the paragraph beginning on line 4 of page 3 of the office letter dated Dec. 6, 1912. A proper affidavit should be filed.

The reference to "congealing below the heat of the blood" in the last two lines of the insert made in line 7 of page 2 should be stricken out since it is without basis in the case as filed. This insert was made when claims to a "butter-like" product were presented which were rejected as being without basis in the case as filed and which were thereupon amended to "lard-like."

A W Lewers

Examiner, Div. 6

Div. 6, Room 518.

John J. Burchenal,

"Food Product."

Filed Nov. 10, 1910,

Serial No. 591,726

F

Paper No. 15
Mar 6 1915
Division 6

APPLICATION ROOM
MAR 5 1915 1
U.S. PATENT OFFICE.

Hon. Commissioner of Patents,

Sir:-

In response to Office action of January 22, 1915, amendment is made as follows:

✓ Page 1 of the specification, line 9, before "white", insert "homogeneous"; same page, line 21, after "product", insert "which"; lines 22, 23, cancel "having a melting-point * * This product".

✓ Page 2, line 1 to 5, inclusive, cancel "The new product * ** 42.5°C." and substitute-

"A lard-like product thus prepared from cottonseed oil has a saponification value of about 195; and an iodine value ranging from about 55 to about 80. The product having an iodine value of 55 has a titer of about 42° and a melting-point of about 40°C.; that having an iodine value of 80 has a titer of about 35° and a melting point of about 33° C."

✓ Page 2, cancel lines 8 to 15, inclusive.

✓ In the amendment filed November 20, 1912, in the insertion made on page 1, after the second paragraph, last line of said insertion, cancel "but below the heat of the blood."

✓ In the same amendment, in the insertion made in line 7 of page 2, at the end of said invention, cancel "but below the heat of the blood."

✓ Cancel claims 1, 2, 3, 4 and substitute:-

840

1. A homogeneous lard-like food product consisting of an incompletely hydrogenized vegetable oil.

2. A homogeneous lard-like food product consisting of incompletely hydrogenized cottonseed oil.

3. A homogeneous lard-like food product consisting of an incompletely hydrogenized vegetable oil, said product being a semi-solid having an iodine value ranging from about 55 to about 80.

4. A homogeneous lard-like food product consisting of incompletely hydrogenized cottonseed oil, said product being a white or yellowish semi-solid having, approximately, an iodine value of 55 to 80, a melting-point of 40 to 35°C., a titer of 42 to 35° C., and giving no reaction for cottonseed oil under the Halphen test.

File the accompanying affidavit.

REMARKS.

It is believed that the present amendment places the application in condition for immediate allowance, and favorable action is asked.

Applicant's affidavit, filed herewith, conforms to the requirements of the Examiner. It also embodies a more accurate redetermination of the melting-point and titer, respectively, of products prepared from cottonseed oil and having the described range in iodine value. While the new figures do not differ substantially from those originally given, it has been thought desirable to substitute them.

The generic claims 1 and 2 have been canceled, for the reason that they have been transferred to applicant's copending application Serial No. 591,727, filed November 10, 1910. They have been replaced by claims directed to a lard-like food product consisting of an incompletely hydrogenized vegetable oil, specifically cottonseed oil. Allowed claims 3 and 4 have been rewritten for clearness, claim 4 embodying the results of the applicant's redetermination of the melting-point and titer of his described product.

Respectfully,

Byrnes, Townsend & Brickenstein
Assc. Attys.

842

Paper No.
Mar 6 1915
Division G

In the matter of the application of

John J. Burchenal

For patent for Food Products; Filed November 10, 1910;

Serial #591,726; Room #315.

STATE OF OHIO.)
: SS:
COUNTY OF HAMILTON)

John J. Burchenal,

the applicant in the above mentioned application, being first duly sworn, deposes and says that the analytical data relating to the composition of the partially hydrogenized oil recited in the amendment to his application inserted on page 2, line 7 thereof, under date of November 20, 1912, were obtained by analysis of a product prepared in the manner described in his said application as filed, said product having the iodine value substantially as set forth in said application.

A redetermination of the melting point and titer corresponding to the iodine value of 55. to 80 in partially hydrogenized cottonseed oil results as follows: for an iodine value of 55, the titer is 42 and the melting point 40° C.; with an iodine value of 80, the titer is 35 and the melting point 33° C.

John J. Burchenal

Sworn to and subscribed before me this 17th day of February, 1915.

Guy B. Taylor
Notary Public in and for
Hamilton County, Ohio.

(SEAL)

843

DEPARTMENT OF THE INTERIOR

UNITED STATES PATENT OFFICE
Washington Mar 16, 1915.

John J. Burchenal, Assor.

Sir: Your APPLICATION for a patent for an IMPROVEMENT in Food Products, filed Nov. 10, 1910, has been examined and ALLOWED.

The final fee, TWENTY DOLLARS, must be paid not later than SIX MONTHS from the date of this present notice of allowance. If the final fee be not paid within that period, the patent on this application will be withheld, unless renewed with an additional fee of $15, under the provisions of Section 4897, Revised Statutes.

The office delivers patents upon the day of their date, and on which their term begins to run. The printing, photolithographing, and engrossing of the several patent parts, preparatory to final signing and sealing, will require about four weeks, and such work will not be undertaken until after payment of the necessary fee.

When you send the final fee you will also send, DISTINCTLY AND PLAINLY WRITTEN, the name of the INVENTOR, TITLE OF INVENTION, AND SERIAL NUMBER AS ABOVE GIVEN, DATE OF ALLOWANCE (which is the date of this circular), DATE OF FILING, and, if assigned, the NAMES OF THE ASSIGNEES.

If you desire to have the patent issue to ASSIGNEES, an assignment containing a REQUEST To that effect, together with the FEE for recording the same, must be filed in this office on or before the date of payment of final fee.

After issue of the patent uncertified copies of the drawings and specifications may be purchased at the price of FIVE CENTS EACH. The money should accompany the order. Postage stamps will not be received.

Final fees will NOT be received from other than the applicant, his assignee or attorney, or a party in interest as shown by the records of the Patent Office.

Respectfully,

Thomas Ewing,
Commissioner of Patents,

Byrnes, Townsend & Brickenstein,

Washington, D. C.

844

2—837.

MEMORANDUM

OF

FEE PAID AT UNITED STATES PATENT OFFICE.

(Be careful to give correct Serial No.)

Serial No. 591,726, *191*

INVENTOR:

John J. Burchenal

PATENT TO BE ISSUED TO

as assigned

NAME OF INVENTION, AS ALLOWED:

Food Products

DATE OF PAYMENT:

Mar. 16, 1916

FEE:

Final, $20

DATE OF FILING:

Nov. 10, 1910

DATE OF CIRCULAR OF ALLOWANCE:

Mar 16, 1916

The Commissioner of Patents will please apply the accompanying fee as indicated above.

BYRNES TOWNSEND & BRICKENSTEIN
Assoc. *Attorneys.*

SEND PATENT TO

A. M. Allen
Gynne Bldg.,
Cincinnati, Ohio.

BYRNES, TOWNSEND & BRICKENSTEIN
PATENT LAWYERS,
910 F STREET, WASHINGTON, D.C.

6—1916

Department of the Interior

UNITED STATES PATENT OFFICE
Washington, D. C.

March 19, 1915

PETITION:

Application of J. J. Burchenal

Serial No. 591726

Invention:

This petition is referred to the Examiner in charge of Division 6 for recommendation. In case he recommends adversely he will state his reasons therefor. and furnish a copy thereof to petitioner.

Thomas Ewing

Commissioner of Patent

846

Amendment - Rule 78 C

Paper No. 16
Mar. 23 1915
Division 6

APPLICATION ROOM
MAR 18 1915 1
U.S. PATENT OFFICE

DOCKET CLERK
MAR 18 1915
U.S. PATENT OFFICE

CPT-D

Div. 6, Room 318

John J. Burchenal

Food Products

Filed Nov. 10, 1910

Ser. No. 591,726

Allowed Mar. 16, 1915

Washington, D.C., Mar. 18, 1915.

HONORABLE COMMISSIONER OF PATENTS,

Sir:-

✓ Amendment is made as follows: at the close of the specification, immediately preceding the claims, add:

"A lard-like composition comprising edible hydrogenized fatty oil, specifically hydrogenized vegetable oil, is claimed in my copending application Serial No. 591,727, filed November 10, 1910.

REMARKS:

It is asked that the foregoing amendment, not affecting the merits, may be entered under the provisions of Rule 78 without withdrawing the case from issue. This amendment consists of a cross-reference to applicant's copending case, and is made in accordance with the Examiner's requirement of March 9, 1915, entitled in application Ser. No. 591,727, filed Nov. 10, 1910

Respectfully,

Approved:
MAR 22 1915
J. T. Newton
First Assistant Commissioner

John J. Burchenal,
By Byrnes Townsend & Brickenstein
Assoc. Attorneys

The proposed corrections being merely formal, it is recommended that this amendment be entered under Rule 78, without withdrawing the case from issue. The final fee has been paid.

A M Lewers
Examiner Div. 6

ADDRESS ONLY
THE COMMISSIONER OF PATENTS
WASHINGTON, D.C.

Serial No. 591,726 Paper No. 17
LETTER MO

EEG

DEPARTMENT OF THE INTERIOR

UNITED STATES PATENT OFFICE
WASHINGTON

March 23, 1915.

In the matter of the Application of John J. Burchenal, Food Products; Filed Nov. 10, 1915, Serial No. 591,726

Amendment.

Sir:

You are hereby informed that the recommendation of the examiner that the amendment be admitted under the provisions of Rule 78, has been approved by the First Assistant Commissioner and the amendment entered.

By direction of the Commissioner:

Very respectfully,

W. F. Woolard,

Chief Clerk.

John J. Burchenal,
c/o Byrnes, Townsend & Brickenstein,
Washington, D. C.

No. 782,820. Patented February 21, 1905.

UNITED STATES PATENT OFFICE.

JACOB E. BLOOM, OF NEW YORK, N. Y.

848

FATTY EDIBLE PREPARATION.

SPECIFICATION forming part of Letters Patent No. 782,820, dated February 21, 1905.

Application filed January 15, 1903. Serial No. 139,200.

To all whom it may concern:

Be it known that I, JACOB E. BLOOM, a citizen of the United States, and a resident of the borough of Manhattan, in the city, county, and State of New York, temporarily residing at New Orleans, parish of Orleans, Louisiana, have invented a certain new and useful Fatty Edible Preparation, of which the following is a specification.

My improvement has for its primary object the changing of the fats or oils to be eaten by man to a compound nearly approximating that of human fat as regards its contents of olein, palmitin, and stearin, and incidentally so that the fats will always remain liquid at the body temperature of 100° Fahrenheit when eaten.

The edible and culinary fats as obtained from natural sources, whether from the animal or vegetable kingdom, are not homogeneous chemical compounds, but consist of certain mixtures of proximate constituents, principally olein, palmitin, and stearin, in varying proportions not at all approximating the proportions of olein, palmitin, and stearin as found in human fat. The human fat of an adult upon analysis was found to contain about eighty-seven per cent. olein and eight per cent. palmitin and two per cent. stearin, and that of a child contains sixty-five per cent. olein and twenty-eight per cent. palmitin and three per cent. stearin, the remainder comprising minute quantities of caproic, myristic, and other undetermined insoluble fatty acids. The said percentages vary in fats from various parts of the body and different ages. The melting-point of human fat is about 63½° to 77° Fahrenheit. To readily pass from the stomach to the duodenum or small intestine (in which and not in the stomach fats or oils are digested) and to be easily digested there, fats or oils should melt at or preferably far below the normal heat of the human stomach—to wit, about 100° Fahrenheit; but this is much lower than the melting-point of beef, mutton, and other flesh fats.

The closer any fat eaten by man resembles human fat as regards its aforesaid percentages of olein, palmitin, and stearin the more easily does it become liquid in the stomach and pass into the duodenum and small intestine and the more readily it is digested and assimilated. The olein readily dissolves a certain portion of stearin and palmitin at body temperature; but any excess of stearin and palmitin over such soluble portions is objectionable and injurious on account of difficulty of digestion and from passing from the stomach into the duodenum, and any such excess over the aforesaid proportions as found in human fat is objectionable, as such excess cannot be assimilated. Such excess is present in large amounts in the crude animal fats, beef and mutton suet, and other fats and oils as now marketed. My improvement removes this excess and provides a superior edible and culinary fat or oil easily digested and totally assimilated.

My improvement has reference chiefly to the olein, palmitin, and stearin contents of edible culinary fats and which together comprise nearly the whole of such fats, as also of human fats.

In my invention of fatty edible preparation, which I call a "destearinized" fat or "humanized" fat, I compound or manufacture same so as to have a predetermined content and to approximate the relative proportions of olein, palmitin, and stearin aforesaid. The exact proportions of the ingredients may be varied within certain limits to best accord with the requirements of different users. Thus the formula preferred for adults comprises eighty-seven per cent. or parts of olein, eight per cent. or parts of palmitin, and two per cent. or parts of stearin, while for a child the formula is changed to sixty-five per cent. or parts of olein, twenty-eight per cent. or parts of palmitin, and three per cent. or parts of stearin. I also find it desirable in some instances to employ a formula comprising seventy-five per cent. olein and twenty-five per cent. palmitin and stearin, the latter two preferably in the ratio of four parts of palmitin to one part of stearin, as in the adult-fat formula aforesaid. These formulas approximate the proportions of olein, palmitin, and stearin as found in human fat. I attain this result by manufacturing my fat of either of the above formulas by any of the methods now well known to scientists skilled in the art of rendering and manufacturing fats and oils.

The preferred method of manufacturing my improved fat from crude animal fats, such as beef-suet, consists in rendering, clarifying, and refining such by any of the present well-known methods, preferably by dry fusion, then permit the rendered fat to settle and remain quiescent for several days, preferably three days, at a low temperature, preferably 60° Fahrenheit, when a large portion of the stearin and palmitin or solid fats will solidify, then by pressure in cloths press or strain out the liquid fat, which latter consists principally of olein with some stearin and palmitin in solution. This latter liquid fat I again subject to the said operation of settling and of straining by pressure in cloths. This second strained liquid fat I analyze to ascertain percentages of olein, palmitin, and stearin, and I then add thereto such portions of olein or of melted stearin or of fused palmitin or of a combination thereof as may be required to constitute the formula aforesaid. The wide range in the melting or congealing points of temperature of olein, stearin, and palmitin affords a ready method by congealing and quiescence and by pressure of removing excess of stearin or palmitin from natural fat or oil.

Though I prefer to manufacture my improved fats from animal fats only, yet I do not restrict myself thereto. I can mix with the rendered animal fats vegetable fats abounding in olein and deficient in solid fats, such as the refined olive-oil or cotton-seed oils or cocoanut-oil or peanut-oil or other nut-oil, or I can add to my animal fats olein or palmitin or stearin from any vegetable or other suitable source to the end that my improved fat shall contain olein, palmitin, and stearin in the proportions aforesaid without removing or excluding other minor fats or ingredients or fatty acids as may be present in the native or natural fats. Though I prefer to compound or manufacture my fat so as to be composed solely of olein, palmitin, and stearin in the proportions aforesaid, yet I also manufacture same so as to comprise said proportions or parts and in addition any other minor healthful fats or fatty acids as found in the native fats. In other words, it is not essential to remove from the native fat other fatty acids than the excess of olein, palmitin, or stearin to constitute said formula.

For ordinary consumption I do not make my improved fat exactly of the same percentages of olein, palmitin, and stearin as found in human fat, not alone for the reason that the latter varies for different ages and different parts of the body, but also because ordinary fats are eaten with other aliments containing small percentages of invisible fats, and when my improved fat is eaten or cooked with such other aliments containing invisible fats the solid portions of the latter are dissolved in the olein of my improved fats, and thus the passage of said solid portions from the stomach to duodenum is facilitated, although it may give a percentage of stearin palmitin in excess of that which will be similated, nevertheless the aforesaid advantage of ease of digestion will be a new and ful one in such cases also. For such ordinary consumption I prefer the above-named fat formula; but where the fat or oil is to consumed alone or with foods or aliments which do not contain other or invisible then I prefer the above-stated formula child or adult, respectively.

Human fat contains a very small amount triglycerid of myristic acid or trimyristin This ingredient is also found in many oils for example, cocoanut-oil, palm-nut oil, dika-nut—for which reason a very small amount of either of said oils may be added to the fat. It is preferred, however, to nutmeg-butter or mace-butter, which contain about forty-five per cent. of trimyristine, the reason that it does not readily become rancid and for the further reason that it gives a flavor to the fat which is very desirable for instance, where an emulsion of the liquid fat only is prescribed. About one-half per cent. of this butter is used.

Besides containing the neutral fats—to wit, olein, stearin, and palmitin—*i. e.*, the triglycerid of oleic acid and of stearic acid and of palmitic acid—human fat also contains small free acids—*i. e.*, oleic acid, &c. In my fat also preferably have some free fatty acids which in addition to filling this want of human fat also perform the function of aiding the emulsion and digestion of all the fats in the small intestine even though there be a deficiency of bile and pancreatic juice. By properly changing the proportions of the other ingredients five or six per cent. of free oleic acid may be added to the fat, or the destearinized fat may by artificial decomposition or otherwise be changed to include five or six per cent. of said acid. The percentage named of said acid is not, however, essential.

Where my improved fat would be liquid at ordinary temperature and when such liquid or oily state would prove unpalatable to some persons, I jellify or partially solidify the liquid fat by some of the well-known methods—as, for instance, by the use of an edible grade of gelatin—avoiding, however, those methods using stearin.

When the liquid fat or oil is to be packed by itself for use from time to time from the original package, any suitable harmless preservative, such as slippery-elm bark, should be cooked with the fat while the latter is being rendered.

I am aware that there are fats and oils made from beef-suet and other fats by extracting from the latter indefinite portions of the solid fats—to wit, stearin and palmitin—the remainder consisting of a so-called "oleo-oil" and which is compounded with other fats

782,820 850 8

ke oleomargarin; but these contain from ty per cent. to fifty-four per cent. olein, balance being stearin and palmitin, with proportion of stearin to palmitin conntly varying, no two manufactures being e, and I am not aware that such products also lard, lard-oil, cotton-seed oil, and er commercial edible or culinary oils and contain the proportions or percentages ve stated of olein, palmitin, and stearin found in human fats, the primary object the invention of my improved fat, never etofore produced. I am aware that the arate parts—to wit, olein, palmitin, and rin—have been heretofore known, as also pounds thereof; but compounds of the portions or percentages thereof as aforehave not been known heretofore in the nection and arrangement aforesaid and the injurious excess of stearin and palin removed.

Having thus described the invention, what lieve to be new, and desire to secure by Letters Patent, is—

1. As a new article of manufacture, a food duct containing olein, palmitin and stearin pproximately the proportions in which the ingredients occur in human fat.

2. As a new article of manufacture, an artilly-prepared edible fat of a predetermined mula comprising olein, palmitin and stearin pproximately the proportions in which the proximate principles exist in human fat.

3. As a new article of manufacture, an artilly-prepared edible fat of predetermined mula analogizing human fat and comprispproximately not less than sixty-five per olein and approximately not more than e per cent. stearin, the remainder of said comprising palmitin.

4. As a new article of manufacture, a deinized artificially-prepared fat for edible culinary purposes having a predetermined ent of olein, palmitin and stearin, the portions of olein comprising approxiely eighty-seven per cent., the remainder prising palmitin and stearin in the apximate ratio of four parts palmitin to one earin.

5. As a new article of manufacture, an edifat comprising olein, palmitin, stearin and oleic acid in approximately the proporin which the said ingredients occur in hufat.

6. As a new article of manufacture, a fat for edible purposes comprising olein, palmitin, stearin and trimyristine in about the proportions in which the said ingredients occur in human fat.

7. As a new article of manufacture, a fat having a predetermined content of olein, palmitin and stearin produced by eliminating from natural, animal or vegetable fat the excess of stearin and palmitin over that occurring in human fat, the said first-mentioned fat comprising among other natural-fat ingredients, olein, palmitin and stearin in substantially the proportions in which the said proximate principles occur in human fat.

8. As a new article of manufacture, an artificially-prepared edible fat melting at below 100° Fahrenheit and having a predetermined content of olein, palmitin and stearin and wherein the percentage of olein in animal or vegetable fats is increased to the requisite extent to produce the proportions of the said ingredients substantially as occurring in human fat.

9. As a new article of manufacture, a fat having a non-cellular structure and comprising olein, palmitin and stearin in approximately the proportions in which the said ingredients are found in human fat.

10. As a new article of manufacture, a fatty composition free from fatty tissue and comprising olein, palmitin, and stearin in approximately the proportions in which the said ingredients are found in human fat.

11. As a new article of manufacture, an edible fat comprising olein, palmitin and stearin in about the proportions in which the said ingredients occur in human fat and nutmeg-butter.

12. As a new article of manufacture, an edible fat comprising olein, palmitin and stearin, trimyristine and free oleic acid in about the proportions stated to analogize human fat.

13. As a new article of manufacture for edible purposes, a fat comprising olein, palmitin and stearin in about the proportions in which the said ingredients occur in human fat and a jellifying ingredient.

14. As a new article of manufacture, a fat comprising olein, palmitin, stearin, trimyristine, free oleic acid and a jellifying ingredient in approximately the proportions stated.

JACOB E. BLOOM.

Witnesses:
JOSEPH G. PARKINSON,
ALBERT H. HETTICH.

Here follow diagram marked p. 851

Berlin Mills
v.
Proj Leo

BERLIN MILLS CO. VS. PROCTER & GAMBLE CO.

P 851

P. SCHWOERER.

APPARATUS FOR TREATING OLEIC ACID.

APPLICATION FILED DEC. 28, 1907.

902,177.

Patented Oct. 27, 190

Figure 1.

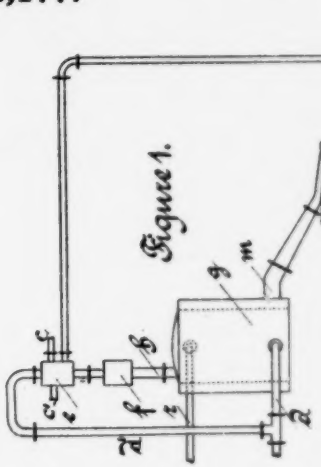


Figure 3.

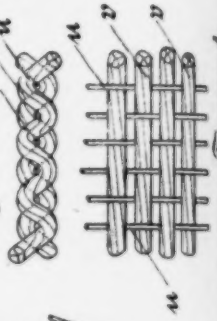
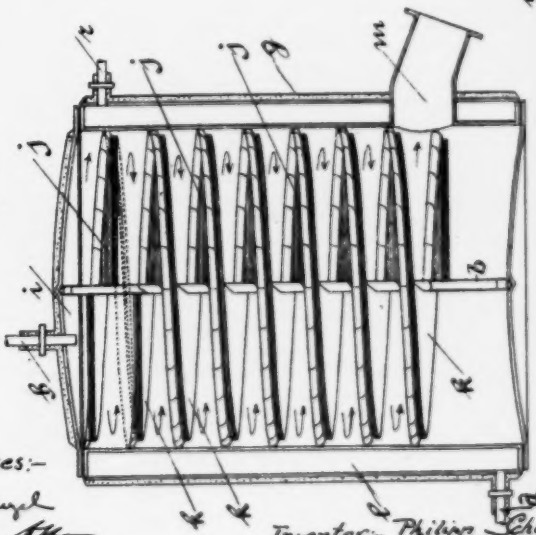


Figure 2.



Witnesses:-

Paul Kimpel

Georg Thos

Inventor: Philipp Schwoerer

by Paul E. Tilly, Atty.

UNITED STATES PATENT OFFICE.

PHILIPP SCHWOERER, OF STRASSBURG, GERMANY.

852

APPARATUS FOR TREATING OLEIC ACID.

No. 902,177. Specification of Letters Patent. Patented Oct. 27, 1908.

Application filed December 26, 1907. Serial No. 408,186.

To all whom it may concern:

Be it known that I, PHILIPP SCHWOERER, a subject of the German Emperor, and resident of Strassburg, Germany, have invented certain new and useful Improvements in Apparatus for Treating Oleic Acid, of which the following is a specification.

The present invention relates to an improved construction of apparatus or device for carrying out the well-known process for transforming oleic acid into stearic acid under the action of hydrogen and in the presence of a finely distributed metal, for instance, nickel, as catalytic agent.

As described by Sabatier and Senderens in their treatise on the catalytic action of finely distributed nickel, (*Annales de Chimie et de Physique*, 1905, page 323), the output of the product rises with the temperature. The latter, however, is limited in the treatment of oleic acid in vapor state, since at a temperature of about 270 centigrade the decomposition of the fatty acids commences and the liberated heavy volatile products of decomposition destroy the activity of the contact-material. Moreover, the product thus obtained could not be used directly in the manufacture of candles.

It has been found that by carrying out the above described-reaction in the evaporator itself, the stated temperature will not be exceeded and can readily be controlled by the evaporating medium, thus doing away with the difficulty of keeping up the temperature in a separate reaction chamber, as well as with the special heating and care otherwise necessary.

In order to make my invention readily understood, I will now describe it with reference to the accompanying drawing, in which Figure 1 shows a diagrammatic view of a complete apparatus, Fig. 2 a vertical section through my improved apparatus, and Figs. 3 and 4 an edge and a plan view, respectively, of the catalytic mass.

The process is preferably carried out in a cylindrical receptacle or reaction chamber provided with a helical pan *i* which extends perpendicularly from the top to near the bottom of the receptacle, and is supported upon a central post *b*.

The oleic acid, gradually heated to a temperature of from 250–270 C., runs, as is well-known in the art, down the helical pan and is driven off below. The reaction chamber is surrounded by a jacket *l* into which superheated steam is introduced at *d*, for the purpose of heating from without and thereby readily regulating the reaction and the evaporation temperature. The steam escapes at *r*. The helical pan *i* upon whose upper surface *j* the substances such as saponified oleic fats, containing oleic acid or the oleic acid, *per se*, continuously spread in a thin layer or film through the inlet *h*, is provided with an upturned outer rim, may or may not be directly connected to the inner wall of the reaction chamber.

According to my invention I apply to the underside of the helical pan *i* the catalytic agent, preferably consisting of an asbestos body *k*, containing a copper or the like metal skeleton and suitably impregnated with nickel, as described for instance by Sabatier and Senderens. Opposite the lowermost turn of the worm there is provided the discharge pipe *m*.

The employment of the helical pan serves the purpose, unlike the other constructions of evaporating chambers, of effecting the continuous reaction of the oleic acid vapor with the hydrogen, without wetting the catalytic agent with liquid oleic acid, which would produce tar formation on it and thus disturb perfect reaction.

The arrangement of the catalytic mass *k* is shown in Fig. 3. The skeleton is formed of wires *n*, *n* of copper like the woof of a fabric. It serves as binder for the asbestos threads *v* serving as warp, which according to Sabatier and Senderens are impregnated with the catalyte.

The operation of my improved device is as follows: The superheated steam combines with the hydrogen in chamber *e* (Fig. 1) for instance by mixing in the hydrogen continuously. The fatty acids, entered through pipe C^1 or other suitable inlet and preferably pre-warmed, are then dissolved by means of an injector *f* into small drops, and are then conducted through pipe *h* into the catalytic apparatus *g* together with the superheated steam and hydrogen. Or the fatty acids may be introduced into the upper part of the helical pan *i* (Fig. 2) in any other suitable manner. They are then heated to a temperature of from 250-270 C. by the regulatable heat within the jacket chamber *l*, and run in a thin layer down the upper surface *j* of the helical pan *i*. Hereby they are volatilized and enter into reaction with the catalytic agent in the presence of the mix-

ture of superheated steam and hydrogen or other gas technically adaptable to catalysis, the catalytic substance, as explained above, being finely distributed over the underside of the helical pan *i* and thus not in direct contact with the liquid oleic acid. The vapors issuing from pipe *m* are condensed in vessel *p* and run through pipe *q* into the vessel *n*. The entrained hydrogen, can be recovered, and re-introduced into the chamber *e*.

This process which transmutes the oleic fatty acid in the vapor state into material for making candles, can be carried out with technical oleic acid, also with oleic fats after saponification, which may be obtained by the lime, magnesia, sulfuric acid, enzyme or other well-known processes.

What I claim is:—

1. In an apparatus for converting oleic acid into stearic acid according to the contact process, a reaction chamber, a helical pan therein, inlet and outlet means for said reaction chamber, and a catalytic agent on the underside of said pan, substantially as and for the purpose set forth.

2. In an apparatus of the type and for the purpose described, a reaction chamber, a stationary helical pan therein conta with the wall of said chamber, inlet and let means for said chamber, a heating about said chamber, inlet and outlet for said jacket, and a catalytic agent distributed over the underside of said substantially as set forth.

3. In an apparatus of the type and fo purposes described, in combination wi reaction chamber and a helical pan the catalytic agent on the underside of said cal pan, substantially as set forth.

4. In an apparatus of the type and fo purposes described, in combination wi reaction chamber and a helical pan the catalytic agent on the underside of said cal pan comprising a copper skeleton, bestos body held by said skeleton, nickel catalytic agent finely distri through and over said asbestos body, stantially as set forth.

In testimony whereof I affix my sig in presence of two witnesses.

PHILIPP SCHWOERE

Witnesses:
CARL W. SCHMITT,
CARL SCHWOERER.

xf Here follows diagram marked p. 854

(855)

xf Here follows diagram marked q.

Def. 7854

E. C. KAYSER.

METHOD FOR SATURATING FATTY ACIDS OR THEIR GLYCERIDS WITH HYDROGEN.

APPLICATION FILED MAR. 20, 1906.

1,004,035. Patented Sept. 26, 1911.

2 SHEETS—SHEET 1.

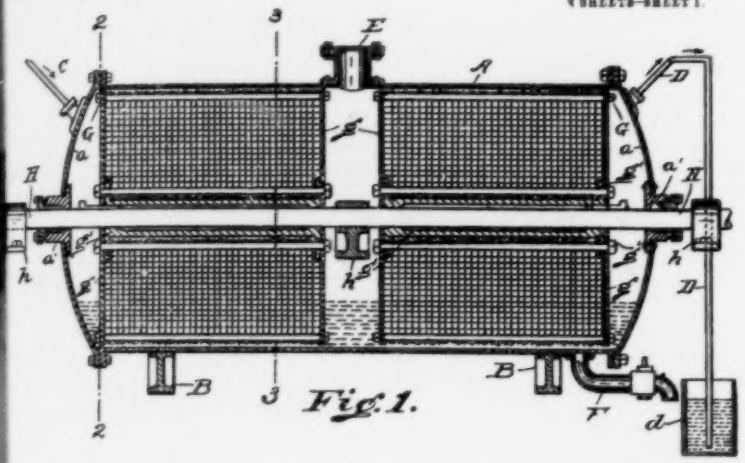


Fig. 1.

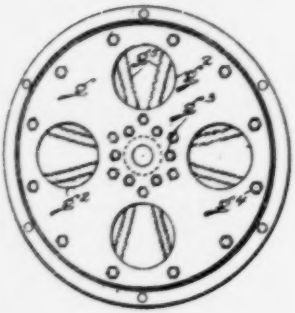


Fig. 2.

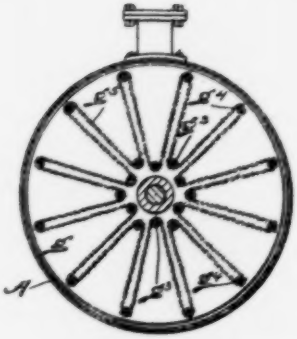


Fig. 3.

Witnesses
Agnes Blount.
[illegible]

Inventor
Edwin Conn Kayser,
By [illegible],
Attorney

433 572

BERLIN MILLS CO. VS. PROCTER & GAMBLE CO.

Appleo Sp 855

E. C. KAYSER.

METHOD FOR SATURATING FATTY ACIDS OR THEIR GLYCERIDS WITH HYDROGEN.

APPLICATION FILED MAR. 20, 1908.

1,004,035.

Patented Sept. 26, 1911.

2 SHEETS-SHEET 1.

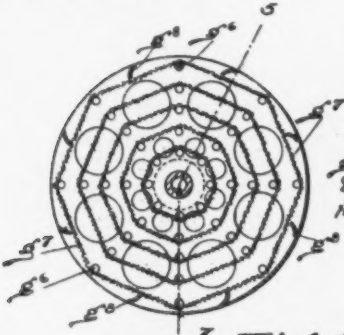


Fig. 4.

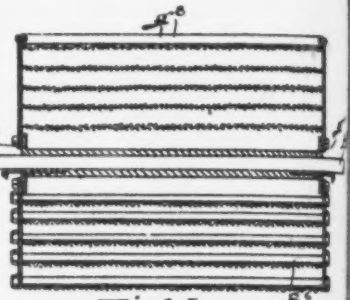


Fig. 5.

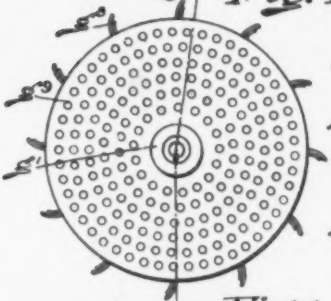


Fig. 6.

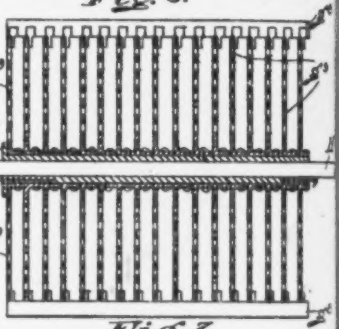


Fig. 7.

Fig. 8.

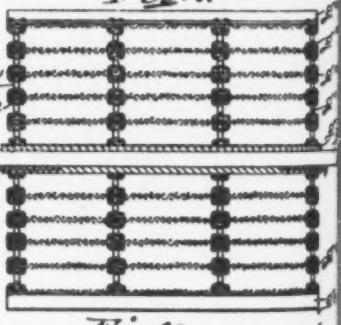


Fig. 9.

Witnesses
Agnes B. Grant.

Inventor
Edwin Emil Kayser,
By George B. Curtis
Attorney

UNITED STATES PATENT OFFICE.

EDWIN CUNO KAYSER, OF CINCINNATI, OHIO, ASSIGNOR TO THE PROCTER & GAMBLE COMPANY, OF CINCINNATI, OHIO, A CORPORATION OF OHIO.

METHOD FOR SATURATING FATTY ACIDS OR THEIR GLYCERIDS WITH HYDROGEN.

1,004,035. Specification of Letters Patent. Patented Sept. 26, 1911.

Application filed March 20, 1908. Serial No. 423,368.

To all whom it may concern:

Be it known that I, EDWIN CUNO KAYSER, a citizen of Great Britain, now residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Methods for Saturating Fatty Acids or Their Glycerids with Hydrogen, of which the following is a specification.

Though it is known in a general way that unsaturated fatty acids or their glycerids may be converted into the corresponding saturated compounds by treatment with gaseous hydrogen in presence of certain finely divided metals, acting as catalyzers, the process cannot be commercially exploited without special methods.

The object of my invention is to provide such methods, and my invention consists in the methods hereinafter described and claimed.

The principal physical and mechanical considerations affecting the practical working of this process, are:—to bring about and maintain, until the desired transformation, be achieved, extensive contact between a mixture of metal and oil and the hydrogen gas, and moreover to produce such friction and impingement, as will enable the gas to penetrate to the recipient metal in spite of the repellent coating of oil. These conditions are attained by propelling in form of films or spray a comparatively small, but ever changing part of the hot oil-mixture, within an atmosphere of hydrogen. While this general principle should be embodied in all apparatus employed to the present purpose, there is considerable latitude in constructive detail.

The preferred form of apparatus consists essentially of a closed horizontal cylindrical vessel, adapted to receive the hydrogen gas and to contain a comparatively small column of the mixture of oil and catalytic metal, in which cylinder is rotatably mounted a paddle wheel, or a plurality of such wheels, having blades of wire gauze or equivalent material.

In the drawings, Figure 1 is a vertical longitudinal section of one form of apparatus embodying my invention; Fig. 2 a section on the line 2—2 of Fig. 1; Fig. 3 a section on the line 3—3 of Fig. 1; Fig. 4, a vertical cross section of a modified form of paddle wheel; Fig. 5, a longitudinal section on the line 5—5 of Fig. 4; Fig. 6 an end view of another modified form of paddle wheel; Fig. 7 a longitudinal section on the line 7—7 of Fig. 6; Fig. 8 an end view of another modified form of the paddle wheel; and Fig. 9 a vertical cross section on the line 9—9 of Fig. 8.

The reference character, A, represents the cylinder, which is mounted upon suitable supports, B, and preferably has dished ends, *a*.

C represents the inlet pipe and D the outlet pipe for the gas, the outlet pipe being sealed at *d* by a column of oil.

E is the charge hole for the oil and metal, and F the discharge tap.

G and G are paddle wheels fixed to a shaft H, mounted in bearings *h* and entering the cylinder through stuffing boxes *a'*. The paddle wheels are formed of end-plates g, fixed to a sleeve g' keyed to the shaft, and provided with openings g^3 for admission of gas, and with an inner and outer series of bolt holes for the reception of rods g^3 and g^4 extending longitudinally of the wheel. The inner series of rods is preferably staggered to permit use of a greater number in a limited area, thereby reducing the lost space. These rods serve as supports for an endless band g^4 of wire gauze, which leads alternately over an inner and an outer rod, as clearly shown in Fig. 3.

In Figs. 4 and 5 I have shown a modified form of the paddle wheel, in which a concentric series of wire gauze polygons are substituted for the wire gauze paddle blades. In this form the paddle wheels are provided with a number of concentric series of longitudinal rods g^6 and with endless bands g^7 of wire gauze. Polygons may be somewhat deficient in agitating action, and I therefore provide a series of peripheral longitudinal scoops g^8 carried by the end plates.

In Figs. 6 and 7 I have shown another form of the paddle wheel, in which a series of perforated disks g^9 mounted upon the shaft, and connected at their outer peripheries by a series of longitudinal scoops g^8, take the place of the paddle blades shown in Figs. 1 to 3.

In Figs. 8 and 9 I have shown another form of paddle wheel, in which a series of concentric gauze cylinders, g^{10}, is mounted about the shaft and supported at regular distances by concentric perforate spacing rings,

g^{11}, connected by bolts g^{12}. The outer rings carry longitudinal agitating scoops g^{8}.

In operation, the bottom of the containing cylinder is supplied with a limited quantity of the mixture of fatty matter and catalytic agent, destined to be engaged by the peripheries of the paddles, which latter, in their rotation, carry a series of films of such mixture through the hydrogen, and in intimate and sustained contact therewith. The paddle wheels are revolved at a speed appropriate to the diameter of the machine, to the number of paddles, and to their particular construction. The best speed must be ascertained empirically. When the hydrogen is supplied under pressure, a lower speed, than would otherwise be required, will answer the purpose.

When working under ordinary pressure, the supply of hydrogen need only be such as to prevent formation of a vacuum within the machine, but a slight excess is generally allowed to pass through and escape from the apparatus, so that steam and gaseous by-products, incidentally generated, may be carried away. When, instead of pure hydrogen, a gas mixture is employed, such as "water-gas," the current must be sufficiently strong to prevent undue accumulation of the indifferent constituents of such gas mixture, notably carbon monoxid, which might otherwise retard or entirely arrest the process.

When pure hydrogen is used under artificial pressure, the gas outlet should be closed by a weighted valve, and the gas supply so regulated as to constantly maintain the desired pressure; but, if "water-gas," or the like, is to be used under pressure, it will be necessary to periodically relieve the pressure by blowing off the inert gas accumulated within the apparatus.

The temperature of the oil and metal mixture may vary within considerable limits, a temperature from 150 to 160° C. will, as a rule, be found suitable.

The time of treatment will vary with the progress realized and with the degree of saturation aimed at.

I claim as my invention:

1. The process of hydrogenizing fatty acids and their esters, which consists in bringing films or spray of a mixture of fatty acid or ester and a pulverulent catalyzer in intimate contact with an atmosphere containing hydrogen.

2. The process of hydrogenizing fatty acids and their esters, which consists in bringing films or spray of a mixture of fatty acid or ester and a pulverulent catalyzer in intimate contact with a compressed atmosphere containing hydrogen.

3. The process of hydrogenizing fatty acids and their esters, which consists in mechanically agitating a mixture of a fatty acid or ester and a pulverulent metallic catalyzer in the presence of hydrogen, whereby the acid or ester and hydrogen are brought into intimate contact with active surfaces of said catalyzer.

4. The process of hydrogenizing fatty acids and their esters, which consists in subjecting the fatty acid or ester, in a closed vessel, to the action of an atmosphere of compressed hydrogen and a metallic catalyzer, and repeatedly bringing different portions of the acid or ester into contact with said atmosphere.

5. The process of hydrogenizing fatty acids and their esters, which consists in mechanically agitating a mixture of a fatty acid or ester and a pulverulent metallic catalyzer in the presence of compressed hydrogen, whereby the acid or ester and hydrogen are brought into intimate contact with active surfaces of said catalyzer.

EDWIN CUNO KAYSER.

Witnesses:
W. W. SYMMES,
AGNES B. GRANT.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

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E. C. KAYSER.

METHOD OF SATURATING FATTY ACIDS OR THEIR GLYCERIDS WITH HYDROGEN.

APPLICATION FILED FEB. 18, 1910.

1,008,474. Patented Nov. 14, 1911.

433 Berlin Mills v. Procter & Gamble 858

Fig. 1.

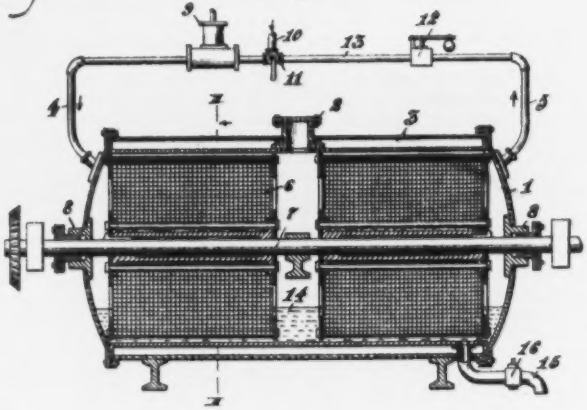
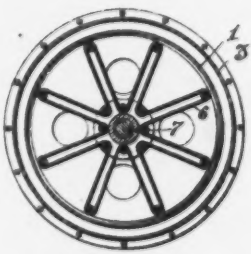


Fig. 2.



Witnesses:
N. P. Leonard.
L. H. Peter.

Inventor:
Edwin Cuno Kayser,
by Burns, Townsend & Brickenstein,
Attys.

859

UNITED STATES PATENT OFFICE.

EDWIN CUNO KAYSER, OF CINCINNATI, OHIO, ASSIGNOR TO THE PROCTOR AND GAMBLE COMPANY, OF CINCINNATI, OHIO, A CORPORATION OF OHIO.

METHOD OF SATURATING FATTY ACIDS OR THEIR GLYCERIDS WITH HYDROGEN.

1,008,474. Specification of Letters Patent. Patented Nov. 14, 1911.

Application filed February 18, 1910. Serial No. 544,630.

To all whom it may concern:

Be it known that I, EDWIN CUNO KAYSER, a subject of the King of Great Britain, and a resident of the city of Cincinnati, in the county of Hamilton and State of Ohio, United States of America, have invented certain new and useful Improvements in Methods for Saturating Fatty Acids or Their Glycerids with Hydrogen, of which the following is a specification.

It is by now well known that unsaturated fatty acids, their glycerids or other esters, in the fluid state, can be made to absorb gaseous hydrogen, until they become converted into the corresponding semi-saturated or saturated compounds, by the intervention of certain finely divided metals, nickel in particular. For that purpose, the nickel-powder is kept in suspension in the hot oil or fatty acid, while hydrogen gas is passed through, or otherwise brought in suitable contact with, the mixture.

In order to sufficiently expedite the transfer of hydrogen for practical purposes, considerable quantities of nickel have to be present. This metal must take the form of an almost impalpable powder and in consequence, when it comes to its separation from the product of reaction, it will be found to form an almost impenetrable sediment on the filter cloth, a fact greatly interfering with the technical applicability of the process. Moreover, for reasons but imperfectly understood, but apparently due to the deposition thereon of carbonaceous by-products, such pure metal soon loses its catalytic activity and cannot be made to repeatedly answer its purpose.

In the catalytic production of sulfuric acid, and in similar industrial processes, where reaction between gases is to be induced, it is customary to spread the catalytic metal or other catalyzer over fibrous materials like asbestos, over fragments of brick or the like inert materials. Since the "catalyst" in these cases remains stationary, such measures are obviously necessary in order to facilitate the transverse movement of the gas through the catalyzer, or in order to produce more contact than a mere passage over a pulverous layer of metal would afford. In the present instance, however, when the metallic particles are already kept apart and readily accessible by their suspension in a liquid medium, it would be considered unnecessary to disseminate active metal over an inert vehicle and the presence of the latter would be judged more likely to impede than to facilitate the reaction. I have, notwithstanding this, ascertained, however, that nickel firmly and evenly deposited upon a voluminous, pulverous inert material exercises in a fluid medium a far more energetic action, and much longer retains its vitality than an equal weight of pure metal in the finest state of division procurable. The method of thus depositing on or coating the pulverous inert material with the nickel powder forms no part of my present invention, which relates to the use of such pulverous nickelized material in the saturation of oils and fats with hydrogen. It will, therefore, be sufficient to state that in order to prepare my catalytic agent I bring suitable soluble or insoluble compounds of nickel in an appropriate manner into intimate combination with an inert absorptive and comparatively bulky mineral substance such as kieselguhr. I then dry and comminute the product, and reducing the powder thus produced with hydrogen, a highly efficient and reliable nickelized, inert pulverous material is the result.

In order to carry out my process, I introduce into a suitable closed receptacle a quantity of the mixture of my fatty material and the pulverized, nickelized inert support, and by means of paddles or stirrers, thoroughly agitate the mixture while introducing the hydrogen. The vessel may either be filled with the charge, in which case the gas has to be atomized within the fluid, or the vessel may be only partly filled, so as to permit the agitators or paddles to propel or project the charge into a surrounding atmosphere of hydrogen. By preference, the hydrogen is supplied under pressure, but a certain amount is always allowed to continuously escape in order to carry off generated steam and other gaseous by-products.

Under suitable precautions, water gas or other gas mixture sufficiently rich in hydrogen gas may be used in place of pure hydrogen. When pure hydrogen is used, under artificial pressure, the gas outlet should be closed by a weighted valve, and the gas supply so regulated as to constantly maintain the desired pressure.

The temperature of the oil mixture may vary within considerable limits. A temperature from one hundred and fifty degrees centigrade to one hundred and sixty degrees centigrade will, as a rule, be found desirable.

The great technical advantage secured by my process in which the nickel powder is firmly and evenly distributed upon the voluminous, pulverous inert material, when mixed with the oil or fat to be treated, may in part be attributed to the ultra-division of the metal, attainable by suitable chemical incorporation, with the inert vehicle, wherein it approaches the colloidal state. It may, however, with equal force be ascribed to a direct coöperation between metal and "inert" body, the latter, present in preponderating quantity and volume, absorbing the hydrogen in the first instance and then yielding it to the metal, which in turn transmits it to the fatty body. The prolonged vitality of the catalyzer may on the other hand be due either to a modified action of the disseminated metal and to a diminished formation of by-products, or to the retention thereof by the inert vehicle, or finally to the more constant physical structure of the metallic particles. Whatever be the cause of the increased activity and prolonged vitality of the metalliferous pulverous catalyzer over the pure metal, the direct technical advantage attained by the change is sufficiently conspicuous. This advantage is further advanced by two other factors, greatly pronounced when using a vehicle like kieselguhr, namely the comparatively low specific gravity and the easy permeability of the catalyzer. The former greatly facilitates suspension in the surrounding fluid, the latter renders rapid and neat separation from the fatty substance by the conventional use of the filter-press an easy matter. Finally, the inert material, which forms by far the principal constituent of a well-made catalyzer, exercises a decolorizing and deodorizing action upon the material treated, far beyond that observed with an equal proportion of pure metal.

Suitable apparatus for carrying out the process is shown in the accompanying drawing, in which—

Figure 1 is a vertical axial section; and Fig. 2 is a vertical transverse section on the line II—II of Fig. 1.

The apparatus illustrated comprises a stationary horizontal cylinder 1, having a manhole 2 for the introduction of oil and catalyzer, a steam jacket 3, hydrogen supply- and discharge-pipes 4, 5, and revolving wire-gauze beaters or agitators 6, carried by a central shaft 7 journaled in stuffing-boxes 8 in the ends of the cylinder. Hydrogen is supplied to the compression-pump 9 through a pipe 10 having a three-way or other cock 11. The unabsorbed excess of hydrogen escaping from the drum through the pipe 5 passes a weighted relief-valve 12 and is thence returned by a pipe 13 to the pump. The liquid mixture of oil and catalyzer to be treated in the cylinder is indicated by the line 14. The product is delivered through the tap 15 having the cock 16.

In practice, the oil to be hydrogenized, for example cotton-seed oil, is preferably charged into the cylinder through the manhole 2 to about the level indicated. A relatively small amount of the nickelized catalyzer, usually less than one per cent. by weight of the oil, is also introduced. The mixture is then heated by steam in the jacket 3 to a temperature of about 150° to 160° C. Hydrogen is pumped into the cylinder through the pipe 4, the unabsorbed excess escaping through the pipe 5 and relief-valve 12, and the wire-gauze beaters are set in motion. The heat, supply of hydrogen and agitation are continued until the oil has been hydrogenized to the desired degree, as shown by its consistency or by determination of its titre and iodin value, usually for several hours and until it has been converted into a product which is solid or semi-solid when cold. The cock 16 is then opened, the mixture of hydrogenized oil and catalyzer is run out through the tap 15, and the catalyzer is filtered out for re-use.

What I claim as new, and of my invention and desire to secure by Letters Patent, is:—

1. The process of hydrogenizing fatty acids and their esters, which consists in agitating in the presence of hydrogen a heated mixture of the fatty acid or ester and a pulverulent catalyzer consisting of a light, voluminous, finely-divided, inert support impregnated with an active metal, whereby the catalyzer is maintained in suspension and the acid or ester and hydrogen are brought into intimate contact with the active surfaces of said catalyzer.

2. The process of hydrogenizing fatty acids and their esters, which consists in mechanically subdividing and agitating, in the presence of an atmosphere of hydrogen, a heated mixture of the fatty acid or ester and a pulverulent catalyzer consisting of a light, voluminous, finely-divided, inert support impregnated with metallic nickel, whereby the catalyzer is maintained in suspension and the acid or ester and hydrogen are brought into intimate contact with the active surfaces of said catalyzer.

3. The process of hydrogenizing fatty acids and their esters, which consists in repeatedly projec..ng or propelling into an atmosphere of compressed hydrogen portions of a heated mixture of the fatty acid or ester and a pulverulent catalyzer consisting of a light, voluminous, finely-divided, inert support impregnated with an ac... metal.

EDWIN CUNO KAYSER.

Attest:
ARTHUR H. EWALD,
EARL W. GRIFFIN.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Pat... Washington, D. C."

Correction in Letters Patent No. 1,008,474.

It is hereby certified that the name of the assignee in Letters Patent No. 1,008,47... granted November 14, 1911, upon the application of Edwin Cuno Kayser, of Cincinnati, Ohio, for an improvement in "Methods of Saturating Fatty Acids or Their Glycerids With Hydrogen," was erroneously written and printed "The Proctor and Gamble Company," whereas it should have been written and printed *The Procter & Gamble Company;* and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 16th day of January, A. D., 1912.

[SEAL.]

C. C. BILLINGS,
Acting Commissioner of Patents.

UNITED STATES PATENT OFFICE.

CARLETON ELLIS, OF MONTCLAIR, NEW JERSEY.

HYDROGENATED BUTTER SUBSTITUTE.

1,038,545. Specification of Letters Patent. Patented Sept. 17, 1912.

No Drawing. Application filed May 21, 1912. Serial No. 700,841.

To all whom it may concern:

Be it known that I, CARLETON ELLIS, a citizen of the United States, and a resident of Montclair, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Hydrogenated Butter Substitutes, of which the following is a specification.

This invention relates to a vegetable butter composition and the process of making same, and relates in particular to the use of hydrogenated vegetable oil, for the production of vegetable butter composition, all as more fully hereinafter described and as claimed.

The common vegetable oils, such as cotton seed oil, corn oil, peanut oil, soy bean oil and the like are too fluid to be used for making butter-like compositions, and also possess odors which are objectionable. The flavor imparted to the butter-like composition by the use of these oils in any quantity, also militates against their use in any large proportion. Sometimes it is possible to use 10 or 15% or so of highly refined vegetable oil in butter-like compositions, but unless the oil is thoroughly deodorized no large proportion ordinarily should be used. By the treatment of these oils with hydrogen in the presence of a catalytic body such as finely divided nickel, or copper, cobalt and the like, or oxids, such as nickel oxid, iron oxid, etc., it is possible to greatly increase the consistency of the oil, so as to produce a firm, solid composition. At the same time the odoriferous components of the oil are apparently destroyed, so that a firm product of pleasant odor is secured. In order, however, to produce a material which is suitably deodorized, it is generally desirable to carry the hydrogenation treatment to a point where a product of rather firm consistency is secured. This produces a material, however, which is of too high a melting point for the production of a vegetable butter composition. These compositions should ordinarily have a melting point considerably less than the temperature of the human body, so that when the material is taken into the mouth, it immediately melts and does not leave a greasy sensation on the tongue and walls of the mouth. In the present invention, therefore, I preferably over hydrogenate the oil for this purpose in order to effect satisfactory deodorization and thus produce a material containing too high a proportion of the vegetable stearin. In order to modify the melting point, the product thus obtained is cooled and the stearin allowed to separate or crystallize from the more oily components. The product is then pressed to remove the excessive amount of stearin, and is then ready to be incorporated with milk or similar material, in order to produce a vegetable butter composition of a character suitable for commercial purposes. If desired, however, the oil may be treated with steam, that is to say it may be blown with steam, using a slight vacuum if desired, and also may be filtered through fullers' earth all according to the nature of the oil to be treated; it being preferable to treat with steam or to filter through fullers' earth after hydrogenation in order to remove any gases which may be left in the oil as a result of the hydrogenation process. The degree of hydrogenation, therefore, depends upon the nature of the oil employed. For example, in the case of cotton seed oil, it is desirable to hydrogenate until the iodin number falls to about 80 or thereabout. The oil may then be cooled to about 30° C. or so, and allowed to stand for a time and then pressed to remove the excess of stearin. It is then melted or warmed to render it entirely fluid, and is incorporated with the milk material. Suitable material of this character is ordinary full milk or skim milk or butter-milk, sterilized milk, sour milk or milk which has been specially fermented using lactic acid ferment and the like. For example, ferment such as *Bacillus butyricus* or *bulgaricus* and the like may be used. In a similar manner Kafir grains or ferment may be employed using a sterilized milk and allowing the ferment to act upon the milk until a suitable transformation in its qualities has been secured. Sour milk is especially desirable because of the excellent butter taste which it gives to product. Condensed milk having perhaps 50% of its water removed is sometimes desirable because of the readiness with which it blends with oily material. Salt, to the extent of 2 to 8% or thereabout, may be added according to the degree of saltiness desired.

Suitable coloring material such as ordinary butter color may likewise be added. Also a flavoring compound such as cumarin and propionic, butyric and capronic acid, as well as various esters and aldehydes such as those of valerian and capryl bodies may be added.

In order to give the product the property of browning, when heated in a skillet, bodies such as egg yolk, milk sugar, lecithin and finely powdered casein and the like may be introduced.

Of the oils mentioned cotton seed and peanut oil are especially suitable, while corn and soy bean oil also are adapted for use in this way. Various other oils may also be incorporated if desired, such as lard and tallow oil, almond oil, olive oil, rape seed oil, cocoanut oil and the like may be added in various proportions, although in general it should be stated that the product preferably should consist of vegetable oil. If oils other than those set forth as preferable in the present invention, are employed, it is desirable also to hydrogenate these to improve their odor. Cocoanut oil is not generally speaking desirable, because of the fact that it has a tendency to become rancid in the presence of moisture.

A suitable oil base having been derived in this manner, the oily material is incorporated with the milk material by a process of emulsification or in any other suitable way to thoroughly blend the milk material with the fatty body. For 100 parts of fatty material about 30 to 60 parts of full milk or perhaps 50 to 80 parts of skim milk are suitable proportions. In the summer months a stiffer composition is required than in the winter months and the fatty material should be compounded to give a material melting at the proper point with reference to seasonal temperatures. In emulsifying it is desirable to put a portion of the milk in the beating apparatus, and to stir for a short time. In the case of full milk, beating for 10 minutes or so, causes a separation of the butter fat. The oil may then be added in portions, beating thoroughly until the composition is well blended. The remainder of milk and fatty material may be added from time to time, and the temperature of the mixture, preferably should be maintained between 30 and 40° C. When the composition has become thoroughly blended, it is run from the blending apparatus into a cooling device which cools the emulsified composition rapidly. It is then ready to be rolled and kneaded to remove the excess of water, etc. The material is then ready to be formed into the desired shape for shipment. The coloring material and salt and also flavoring material may be added during the emulsification process if desired. Ordinary butter or renovated butter may be introduced in moderate amount to improve the flavor if this is deemed desirable.

Where the term oil or fat is used herein it should be understood to refer to material of an oleaginous nature, and that the term fat or oil is used indiscriminately in both specification and claims to comprise or embrace suitable fatty material.

Reference is made herein to my co-pending application Serial No. 715,209, filed August 15, 1912, as regards certain divisional matter which is not claimed herein.

What I claim is:—

1. The process of making a butter-like composition which comprises incorporating edible hydrogenated oil with milk material.

2. The process of making a butter-like composition which comprises incorporating edible hydrogenated fatty oil with milk material.

3. The process of making a butter-like composition which comprises incorporating edible hydrogenated fatty oil with milk material and in expressing the excess of moisture.

4. The process of making a butter-like composition which comprises incorporating edible hydrogenated vegetable oil with milk material and in expressing the excess of moisture.

5. The process of making a butter-like composition which comprises incorporating by emulsification edible hydrogenated vegetable oil with milk material and in expressing the excess of moisture.

6. The process of making a butter-like composition which comprises hydrogenating an edible vegetable oil, pressing to remove the excess of stearin and incorporating the more fluid components with milk material and in expressing the excess of moisture.

7. A butter-like composition comprising edible hydrogenated fatty oil.

8. A butter-like composition comprising edible hydrogenated vegetable oil.

9. A butter-like composition comprising edible hydrogenated fatty oil and moisture.

10. A butter-like composition comprising edible hydrogenated vegetable oil and moisture.

11. A butter-like composition comprising edible hydrogenated vegetable oil and milk material.

12. A butter-like composition comprising edible hydrogenated vegetable oil and sour milk material.

13. A butter-like composition comprising edible hydrogenated vegetable oil, milk material and flavoring material.

14. A butter-like composition comprising edible hydrogenated oil freed from excessive amounts of stearin, milk material and flavoring material.

15. A butter-like composition comprising edible hydrogenated vegetable oil, milk material, flavoring material, and salt.

16. A butter-like composition comprising edible hydrogenated vegetable oil, milk material, flavoring material, salt and coloring material.

17. A butter-like composition comprising edible hydrogenated vegetable oil, sour milk material, flavoring material, salt, and coloring matter.

18. A butter-like composition comprising edible hydrogenated fatty oil freed from excess of stearin produced by hydrogenation, milk material and flavoring material.

19. A butter-like composition comprising edible hydrogenated vegetable oil, sour milk material, flavoring material, salt, and coloring matter; said composition being adjusted as to melting point whereby it becomes fluid at a temperature less than that of the human body.

20. A butter-like composition comprising edible hydrogenated vegetable oil and milk material of reduced moisture content.

21. A butter-like composition comprising edible hydrogenated oil and milk material, said composition containing elements producing browning when heated.

22. A butter-like composition comprising edible hydrogenated vegetable oil and milk material containing *Bacillus bulgaricus*.

23. A butter-like composition comprising edible hydrogenated oil and milk material containing ferment.

24. A butter-like composition comprising edible hydrogenated oil of reduced stearin content.

25. A butter-like composition comprising edible hydrogenated cotton seed oil and milk material.

26. A butter-like composition comprising edible hydrogenated cotton seed oil in a state of emulsion.

Signed at Montclair in the county of Essex and State of New Jersey this 29th day of May, A. D. 1912.

CARLETON ELLIS.

Witnesses:
BIRDELLA M. ELLIS,
ANITA B. FERRIS.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

UNITED STATES PATENT OFFICE.

JOHN J. BURCHENAL, OF CINCINNATI, OHIO, ASSIGNOR TO THE PROCTER AND GAMBLE COMPANY, OF CINCINNATI, OHIO, A CORPORATION OF OHIO.

FOOD PRODUCT.

1,135,935. Specification of Letters Patent. Patented Apr. 13, 1915.

No Drawing. Application filed November 10, 1910. Serial No. 591,727.

To all whom it may concern:

Be it known that I, JOHN J. BURCHENAL, a citizen of the United States, and a resident of the city of Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Food Products, of which the following is a specification.

This invention is a food compound closely simulating lard in its physical and chemical characteristics, consisting of a mixture of an oil and a hardening agent produced by hydrogenizing an oil or liquid fat.

In its preferred form, the new product is a vegetable one, consisting of a mixture of about 85 per cent. of cotton-seed oil and 15 per cent. of hydrogenized cotton-seed oil. In the manufacture of this product, cotton-seed oil, oleic acid, or other suitable body containing unsaturated fatty acids or their glycerids or esters, is hydrogenized, or caused to chemically absorbe hydrogen. This reaction is preferably effected by vigorously agitating the cotton-seed oil or other raw material in a closed vessel containing an atmosphere of compressed hydrogen, a catalytic agent, such as kieselguhr impregnated with finely-divided nickel, being maintained in suspension in the oil and the charge being heated to a temperature of about 155° C. The oil is thereby converted into a white or yellowish solid, containing additional hydrogen about 5 to 6 per cent. more than in the nonhydrogenized material, having a saponification value of about 190, an iodin value of about 20, a melting point of about 56° C., and a titer of about 55° C., giving no reaction for cotton-seed oil under the Halphen test. Suitable proportions of the hydrogenized and hardened oil and of the non-hydrogenized oil are now thoroughly mixed or blended. In case about 15 per cent. of hydrogenized cottonseed oil and 85 per cent. of non-hydrogenized cottonseed oil are thus mixed, the final product is a white or yellowish semi-solid, having a saponification value of about 195; an iodin value of about 95; a melting-point of about 42° C.; and a titer of about 36° C.

The invention is not restricted to hydrogenizing the oil which is used for hardening to the particular degree above specified, nor to its use in the particular proportions mentioned. In case a harder hydrogenized stock is used, it will be understood that its proportion may be correspondingly reduced. For example, if the oil used for hardening is hydrogenized to an iodin value of 9, approximately 10 per cent. of the hardened material will be required to yield a mixture having physical constants approximately as above specified.

I claim:

1. A lard-like composition comprising edible hydrogenized fatty oil.

2. A lard-like composition comprising edible hydrogenized vegetable oil.

3. An edible oil product comprising hydrogenized cottonseed oil and edible oily material blending therewith.

4. An edible oil product of lard-like consistency, comprising edible hydrogenized oil and edible oily material blending therewith.

5. An edible fatty product of substantially lard-like consistency, comprising edible hydrogenized-oil material and edible fatty material blending therewith.

6. An edible fatty product, comprising edible hydrogenized oil material and edible fatty material blending therewith.

7. A food-product comprising an intimate mixture of hydrogenized vegetable oil and non-hydrogenized vegetable oil.

8. A food-product comprising an intimate mixture of a vegetable oil and a hydrogenized portion of the same variety of the vegetable oil.

9. A food-product comprising an intimate mixture of hydrogenized cottonseed oil and non-hydrogenized cottonseed oil.

10. A food-product simulating lard in physical and chemical characteristics and comprising an intimate mixture of hydrogenized vegetable oil and non-hydrogenized vegetable oil.

11. A food-product simulating lard in physical and chemical characteristics and comprising an intimate mixture of a vegetable oil and a hydrogenized portion of the same variety of the vegetable oil.

12. A food-product simulating lard in physical and chemical characteristics and comprising an intimate mixture of hydrogenized cottonseed oil and non-hydrogenized cottonseed oil.

13. A food product, consisting of a mixture of a liquid oil or fat and a solid hydrogenized oil or fat, being a semi-solid having, approximately, a saponifica-

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value of 195, an iodin value of 95, a melting point of 42° C., and a titer of 36° C.

14. A food product, consisting of a mixture of about 85 per cent. of cotton-seed oil and 15 per cent. of hydrogenized cotton-seed oil, being a white or yellowish semi-solid having, approximately, a saponification value of 195, an iodin value of 95, a melting point of 42° C., and a titer of 36° C.

JOHN J. BURCHENAL.

Attest:
A. G. FRENCH,
R. B. MEAD.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents Washington, D. C."

867

N° 1515 A.D. 1903

Date of Application, 21st Jan., 1903

Complete Specification Left, 20th Oct., 1903—Accepted, 28th Nov., 1903

PROVISIONAL SPECIFICATION.

Process for Converting Unsaturated Fatty Acids or their Glycerides into Saturated Compounds.

I, WILHELM NORMANN, Doctor of Philosophy, of Herford, Westphalia, in the German Empire, do hereby declare the nature of my invention to be as follows:—

The property of finely divided platinum, to exercise a catalytic action with hydrogen, as it does with oxygen, is already known. For instance, Wilde observed the following reaction taking place in the presence of platinum black:

$$\left.\begin{matrix} C_2H_2 + H_2 = CH_2 - CH_2 \\ C_2H_4 + H_2 = CH_3 - CH_3 \end{matrix}\right\}$$

and Debus noticed the reaction:

$$HCN + H_2 = CH_2NH_2$$

Recently Sabatier and Senderens, of Paris, have discovered that other finely divided metals will also exercise a catalytic effect on hydrogen, *viz.* iron, cobalt, copper and especially nickel.

By causing acetylene, ethylene, or benzene vapour in mixture with hydrogen gas to pass over one of the said metals (which had just been reduced in a current of hydrogen) the said investigators obtained from the unsaturated hydrocarbons saturated hydrocarbons, partly with simultaneous condensation.

I have found, that by this catalytic method it is easy to convert unsaturated fatty acids into saturated acids.

This may be effected by causing fatty acid vapours together with hydrogen to pass over the catalytic metal, which is preferably distributed over a suitable support, such as pumice stone. It is sufficient, however, to expose the fat or the fatty acid in a liquid condition to the action of hydrogen and the catalytic substance.

For instance, if fine nickel powder obtained by reduction in a hydrogen current, is added to chemically pure oleic acid, the latter heated over an oil bath and a strong current of hydrogen is caused to pass through it for a considerable time, the oleic acid may be completely converted into stearic acid.

The quantity of the nickel thus added and the temperature are immaterial and will only affect the duration of the process. Apart from the formation of small quantities of nickel soap, which may be easily decomposed by dilute mineral acids, the reaction passes off without any secondary reaction. The same nickel may be used repeatedly. Instead of pure oleic acid, commercial fatty acids may be treated in the same manner. The fatty acid of tallow which melts between 44 and 48° C. has an iodine number 36.1 and a yellow colour, will after hydrogenation, melt between 56.5 and 59°, while its iodine number is 9.8 and its colour slightly lighter than before, and it will be very hard.

The same method is applicable not only to free fatty acids, but also to the glycerines occurring in nature, that is to say, the fats and oils. Olive oil will yield a hard tallow-like mass; linseed oil and fish oil will give similar results.

By the new method, all kinds of unsaturated fatty acids and their glycerides may be easily hydrogenised. It is not necessary, to employ pure hydrogen for

[*Price 8d.*]

2 868 N° 1515.—A.D. 1903.

Converting Unsaturated Fatty Acids or their Glycerides into Saturated Compounds.

the purpose of the present invention: commercial gas mixtures containing hydrogen, such as water gas, may also be used.

Dated this 21st day of January 1903.

FAIRFAX & WETTER
Patent Agents for the Applicant.

COMPLETE SPECIFICATION.

Process for Converting Unsaturated Fatty Acids or their Glycerides into Saturated Compounds.

I, WILHELM NORMANN, Doctor of Philosophy, of Herford, Westphalia, in the German Empire, do hereby declare the nature of this invention and in what manner the same is to be performed to be particularly described and ascertained in and by the following statement:—

The property of finely divided platinum, to exercise a catalytic action with hydrogen as it does with oxygen, is already known. For instance, Wilde observed the following reaction taking place in the presence of platinum black:

$$C_2H_2 + H_4 = CH_3 - CH_3$$
$$C_2H_4 + H_2 = CH_3 - CH_3$$

and Debus noticed the reaction:

$$HCN + H_4 = CH_3NH_2$$

Recently Sabatier and Senderens have discovered that other finely divided metals will also exercise a catalytic effect on hydrogen, *viz.* iron, cobalt, copper, and especially nickel.

By causing acetylene, ethylene, or benzene vapour in mixture with hydrogen gas to pass over one of the said metals, the said investigators obtained from the unsaturated hydrocarbons saturated hydrocarbons, partly with simultaneous condensation.

I have found, that it is easy to convert by this catalytic method unsaturated fatty acids into saturated acids. This may be effected by causing vapours of fatty acid together with hydrogen to pass over the catalytic metal, which is preferably distributed over a suitable support, such as pumice stone. It is sufficient, however, to expose the fat or the fatty acid in a liquid condition to the action of hydrogen and the catalytic substance.

For instance, if fine nickel powder obtained by reduction in a current of hydrogen, is added to chemically pure oleic acid, then the latter heated over an oil bath, and a strong current of hydrogen is caused to pass through it for a sufficient length of time, the oleic acid may be completely converted into stearic acid.

The quantity of the nickel thus added and the temperature are immaterial and will only affect the duration of the process. Apart from the formation of small quantities of nickel soap, which may be easily decomposed by dilute mineral acids, the reaction passes off without any secondary reaction taking place. The same nickel may be used repeatedly. Instead of pure oleic acid, commercial fatty acids may be treated in the same manner. The yellowish fatty acids of tallow, which melt between 44 and 48° C and whose iodine number is 35.1, will, after hydrogenation, melt between 56.5 and 59° C, while their iodine number will be 9.8 and their colour slightly lighter than before, and they will be very hard.

The same method is applicable not only to free fatty acids, but also to their

glycerides occurring in nature, that is to say, to fats and oils. Olive oil will yield a hard tallow-like mass; linseed oil and fish oil will give similar results.

By the new method, all kinds of unsaturated fatty acids and their glycerides may be easily hydrogenised. It is not necessary, to employ pure hydrogen for the purpose of the present invention; commercial gas mixtures containing hydrogen, such as water gas, may also be used.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed I declare that what I claim is:—

1. The process for converting unsaturated fatty acids or their glycerides into saturated compounds, which consists in treating the said fatty bodies with hydrogen in the presence of a finely divided metal adapted to act as a catalyser, substantially as described.

2. The herein described manufacture of saturated fatty compounds from unsaturated fatty acids or their glycerides by means of water gas or similar gas mixtures.

Dated this 19th day of October 1903.

W. NORMANN
By Fairfax & Wetter
Patent Agents
37 and 39, Essex Street, Strand, London.

Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.—1903.

[Second Edition.]

870

N° 2520 A.D. 1907

Date of Application, 31st Jan., 1907

Complete Specification Left, 31st July, 1907—Accepted, 30th Jan., 1908

PROVISIONAL SPECIFICATION.

"Improvements in and relating to the Reduction of Organic Substances."

We, FRED BEDFORD, Ph.D., B.Sc. Lond. of Sleaford, Lincoln, Chemist, and CHARLES EDWARD WILLIAMS, of Thornhayes, Sleaford, Lincoln, Seed Crusher, do hereby declare the nature of this invention to be as follows:—

This invention relates to the reduction of organic substances such as organic unsaturated fluids and solids when converting them into saturated compounds, for instance, the conversion of unsaturated fatty acids or their esters into saturated acids or their esters respectively, or the reduction of nitro-bodies, such as for instance, nitro-benzole, and ketones for example benzo-phenone.

It has already been proposed to effect conversion of unsaturated acids into saturated acids by treating the unsaturated acid, when in a liquid condition, with hydrogen in the presence of a metal such as nickel, possessing catalytic properties, the metal distributed in a finely divided state on a support such as pumice stone being inserted in the liquid acid through which hydrogen was passed. This known method has the disadvantage that nickel soap is formed or the nickel is carried away in suspension so that not only are subsequent steps required to remove the nickel from the saturated acid but the nickel remaining on the pumice stone soon fails to be effective and has to be replenished, the method therefore being incomplete and intermittent.

Further, according to the known method the fat is treated in bulk so that the whole of it has to be treated in order to effect complete conversion and consequently a very long time is necessary. The hydrogen current also has to be very strong in order to maintain the nickel in suspension.

The objects of the present invention are to effect reductions with great rapidity without the necessity of heating to high temperatures the substances to be treated, thereby avoiding decomposition of the latter, and deterioration of the catalytic substance.

A further object of the invention is to effect the reduction of such substances without formation of bye-products such as, for instance, nickel soap, and to enable the reduction to be carried on practically continuously.

The invention consists in bringing the liquid or fluid to be treated into contact with the catalytic substance in the form of fine drops or spray or as a film.

The invention also consists in continuously passing unsaturated fluid or other substance to be reduced, introduced in form of spray or fine drops, over the nickel or other catalytic substance with or against a current of hydrogen so that a continuous supply of saturated acid or the like can be obtained.

The invention further consists in distributing the nickel or other catalytic substance upon its support in such a manner that when in the presence of the unsaturated fluid, or other substance to be reduced, and hydrogen, its action is purely catalytic and it cannot be carried away in suspension, so that the saturated fluid or reduced substance obtained is free of nickel or nickel compounds.

In carrying out the invention according to one mode when nickel, for example, is used as the catalytic substance, nickel nitrate is dissolved in water. The substance which is to form the support for the nickel—say coke, porous

Improvements in and relating to the Reduction of Organic Substances.

brick or the like—is then placed in the solution which is allowed to stand for some time after which the excess of solution is drawn off. The coke or other support is then heated over a fire (in a crucible) to convert the nitrate into oxide. If the layer is too thin the operation of soaking in nitrate solution and heating must be repeated. Finally it is introduced into a suitable receptacle or tower and heated to say from 275° to 285° C in a current of hydrogen with or without the addition of ether or other inert organic vapour to convert the nickel oxide into nickel and as soon as reduction is complete the contents are allowed to cool to the temperature at which the reduction of the organic substance, or the conversion of unsaturated into saturated compound, is to take place (*e.g.* for oleic acid and oils 170°—185° C, nitro-bodies ketones and aldehydes from 90° to 160° C.). The heating may be effected in any usual manner as for instance by an oil bath.

In some cases the heating of the support saturated with nickel nitrate solution first over a fire can be dispensed with, the nitrate is then converted to metallic nickel.

As soon as reduction is complete and the contents have been allowed to cool to the temperature at which the reduction of the organic substance, or the conversion of unsaturated into saturated compound, is to take place, a current of hydrogen is forced in from below to mingle with the liquid or fluid, the mixture being thereby exposed to or brought into contact with the nickel, which causes the substance treated to take up hydrogen or to be reduced. The reduced substance leaves the tower in a reduced condition and free of nickel or nickel compounds, the reduced substance being drawn off as it is formed preferably continuously.

According to this manner of carrying out the invention the unsaturated liquid or other substance to be reduced flows in drops or as a spray or as a film over the nickel coated material and is thus exposed simultaneously to large surfaces of nickel and hydrogen, the latter being in excess.

It has been found by experiment that oleic acid can be fed continuously into the tower, issuing therefrom in the form of stearic acid which is not only free from nickel or nickel compounds and requires no further treatment, but is also bleached. A practically continuous supply of bleached stearic acid can thus be obtained by one step, without the nickel being replenished.

Unsaturated gases may be treated according to the invention with the nickel prepared in above manner.

The support for the nickel or other catalytic substance employed may be in the form of grids, plates tubes or the like capable of offering a large surface and of being arranged to suitably retard the progress of the acid sufficiently long to ensure intimate and simultaneous contact of the liquid or fluid and hydrogen with the nickel film or surface.

As long as the nickel is distributed in such a way that it cannot be carried away in suspension by the acid, but has purely a catalytic action, the exact mode of applying it to its support may be varied for instance, it may be applied electrolytically as long as it is heated as hereinbefore described.

Instead of using pure hydrogen we may employ water gas free from sulphur or other commercial gas mixture, containing hydrogen.

Dated this 31st day of January, 1907.

MARKS & CLERK.

COMPLETE SPECIFICATION.

"Improvements in and relating to the Reduction of Organic Substances".

We, FRED BEDFORD, Ph.D., B.Sc. Lond. of Sleaford, Lincoln, Chemist, and CHARLES EDWARD WILLIAMS, of Thornhayes, Sleaford, Lincoln, Seed Crusher,

N° 2520.—A.D. 1907. **872** 8

Improvements in and relating to the Reduction of Organic Substances.

do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to the reduction of organic substances such as organic unsaturated fluids and solids when converting them into saturated compounds, for instance, the conversion of unsaturated fatty acids or their esters into saturated acids or their esters, respectively, or the reduction of nitro-bodies, such as for instance, nitro-benzole and ketones for example benzo-phenone.

It has already been proposed to effect the conversion of unsaturated acids into saturated acids by treating the unsaturated acid, when in a liquid condition, with hydrogen in the presence of a metal such as nickel, possessing catalytic properties, the metal distributed in a finely divided state on a support such as pumice stone being inserted in the liquid acid through which hydrogen was passed.

According to the known method the fat is treated in bulk so that the whole of it has to be treated in order to effect complete conversion and consequently a very long time is necessary.

The objects of the present invention are to effect reductions with great rapidity without the necessity of heating to unduly high temperatures the substance to be treated thereby avoiding decomposition of the latter.

A further object of the invention is to effect the reduction of such substances without formation of bye-products such as, for instance, nickel soap and to enable the reduction to be carried on practically continuously.

The invention consists in bringing the substance to be treated—in the liquid state or in solution—into contact with the catalytic substance in the form of fine drops or spray or as a film, and so that the catalytic substance and hydrogen are in excess.

The invention also consists in continuously passing the substance to be reduced—by itself or in solution—introduced in the form of spray or fine drops, over the nickel or other catalytic substance with or against a current of hydrogen so that a continuous supply of reduced substance can be obtained.

In carrying out the invention according to one mode when nickel, for example, is used as the catalytic substance, it is deposited on its support by the reduction from its nitrate, the substance which is to form the support for the nickel—say pumice-stone, porous earthenware or the like—being placed in the nitrate solution which is allowed to stand for some time after which the excess of solution is drawn off, or the nitrate solution is allowed to flow on to the support in vacuum. The pumice stone or other support is then heated over a fire (in a crucible) to convert the nitrate into oxide. If the layer is too thin the operation of soaking in nitrate solution and heating must be repeated. Finally it is introduced into a suitable receptacle or tower and heated to say from 275° to 300° C. in a current of hydrogen with or without the addition of ether or other suitable organic vapour to convert the nickel oxide into nickel and as soon as reduction is complete the contents are allowed to cool to the temperature at which the reduction is to take place (*e.g.* for oleic acid and oils 160° to 200° C.)

The heating may be effected in any usual manner, as for instance, by an oil bath.

In some cases the heating of the support saturated with nickel nitrate solution first over a fire can be dispensed with, the nitrate is then converted direct to metallic nickel.

As soon as the conversion of nickel oxide or nickel nitrate to metallic nickel is complete the contents are allowed to cool to the temperature at which the reduction of the organic substance is to take place. The substance to be reduced is fed into the top of the tower in the form of spray or the like and a current of hydrogen is forced in from below to mingle with the same the mixture being thereby exposed to or brought into contact with the nickel,

Improvements in and relating to the Reduction of Organic Substances.

which causes the substance to be reduced. The substance leaves the tower in a reduced condition and free of nickel or nickel compounds, the reduced substance being drawn off as it is formed, preferably continuously. In order to obtain a spray the liquid may be fed into the tower through a screen or a plate provided with a large number of small holes or capillary tubes.

According to this manner of carrying out the invention the unsaturated liquid or other substance to be reduced flows in drops or as a spray or as a film over the nickel coated material and is thus exposed simultaneously to large surfaces of nickel and hydrogen, both the latter being in excess.

It has been found by experiment that chemically pure oleic acid can be fed continuously into the tower issuing from the base of the tower in the form of stearic acid (melting point 69° C.). Out of commercial oleic acid was obtained a stearic acid solidifying at 60° C. The stearic acid is not only free from nickel or nickel compounds and requires no further treatment, but is also bleached. A practically continuous supply of bleached stearic acid can thus be obtained by one step, without the nickel being replenished.

Linseed oil is converted in a solid with solidifying point 53° C.

The hydrocarbons $C_{17}H_{32}$ and $C_{17}H_{30}$ (prepared from linseed oil) give heptadecane.

The ethyl ester of linoleic acid is converted quantitatively into the ethyl ester of stearic acid.

Paraffin wax with solidifying point 40° C gives a paraffin wax with solidifying point 43° C.

The support for the nickel or other catalytic substance employed may be in the form of grids, plates, tubes or the like capable of offering a large surface and of being arranged to suitably retard the progress of the acid or substance to be reduced sufficiently long to insure intimate and simultaneous contact of the liquid and hydrogen with the nickel film or surface.

As long as the nickel is distributed in such a way that it cannot be carried away in suspension by the acid or reduced substance, the exact mode of applying it to its support may be varied.

Instead of using pure hydrogen we may employ water gas, free from sulphur, or other commercial gas mixture containing hydrogen.

Having now particularly described and ascertained the nature of our said invention, and in what manner the same is to be performed we declare that what we claim is:—

1. In a process for reducing organic substances wherein the substance to be reduced is treated with hydrogen in the presence of a catalytic substance, bringing the substance to be treated into contact with the catalytic substance in a liquid state or in solution in the form of fine drops or spray, or as a film and so that the catalytic substance and hydrogen are in excess.

2. In a process for reducing organic substances, wherein the substance to be reduced is treated with hydrogen in the presence of a catalytic substance, continuously passing the substance to be reduced—by itself or in solution—in the form of spray or fine drops, over the catalytic substance with or against a current of hydrogen so that a continuous supply of reduced substance can be obtained.

3. The process for reducing organic substances hereinbefore described.

Dated this 31st day of July 1907.

MARKS & CLERK.
18, Southampton Buildings, London, W.C.
13, Temple Street, Birmingham, and
30, Cross Street, Manchester,
Agents.

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874 *Translation.*

German Patent No. 141,029.

Herforder Maschinenfett & Oelfabrik, Le Prince & Siveke, of Herford.

Patented August 14, 1902.

Published May 4, 1903.

Process for Converting Unsaturated Fatty Acids or Their Glycerides into Saturated Compounds.

It was discovered some time ago that finely divided platinum has the property of acting catalytically not only as regards oxygen but also hydrogen in an analogous manner. Thus, Wilde, in 1874, observed the following reaction in presence of platinum black:

$$C^2\ H^2+H^4=C\ H^3—C\ H^3,$$
$$C^2\ H^4+H^2=C\ H^3—C\ H^3.$$

and Debus:

$$H\ C\ N+H^2+C\ H^3\ N\ H^2.$$

More recently Sabatier and Senderens, of Paris, discovered that other finely divided metals, namely, iron, cobalt, copper, and especially nickel, have a similar catalytic action with regard to hydrogen. By causing acetylene, ethylene, benzene vapors, etc., mixed with hydrogen, to pass over one of the metals named, which had been newly reduced in the hydrogen current, these scientists obtained from non-saturated hydrocarbons saturated hydrocarbons, partly with simultaneous condensations. They also succeeded in reducing carbon monoxide and carbon dioxide in methane and nitrogenzene to aniline.

The iventors found that by means of this contact method it is easy also to transfer non-saturated fatty acids into saturated ones.

875 To this end a process similar to the sulfuric acid process may be used, causing the fatty acid vapors together with hydrogen to pass over the contact metal, which latter is preferably distributed over a base, such as pumice stone. But it is also sufficient to expose the fat or fatty acids in the liquid state to the action of hydrogen and of the contact mass. If, e. g., fine nickel powder, obtained by reduction in the hydrogen current, is added to chemically pure oleic acid, heated in the oil bath, and a powerful current of hydrogen gas is caused to pass through it for some time, the oleic acid is completely transformed into stearin acid, provided the action is continued for a sufficient length of time. The amount of nickel added and the degree of temperature are immaterial and affect at most only the duration of the process. Aside from the formation of small quantities of nickel soap, which may be easily decomposed with diluted mineral

acids, no secondary reaction accompanies the reaction. The same nickel may be used several times.

The behavior of fatty acids obtained by technical means is similar to that of pure oleic acid, as shown by the following table:

	Melting Point	Iodine Value	Color
	Melting point.	Iodine value.	Color.
Stearic fatty acids	44 to 48°	35.1	Yellowish
Hydrogenized stearic fatty acids:			Slightly lighter than above,
	56.5 to 59°	9.8	very hard.
Techn. commercial stearic acid.	50 to 53°	23.9	White

876 Similar to the behavior of free fatty acids is that of their naturally occurring glycerids, the fats and oils. From olive oil a hard tallow-like mass is obtained by the process described, also from linseed oil and from blubber (train) oil.

Hence all kinds of non-saturated fatty acids and their glycerids may be easily hydrogenized by this process.

It is not necessary to use pure hydrogen for the purpose of reduction in the above described process; commercial gases containing hydrogen, such as water gas, may be used instead.

Claim.

Process for converting unsaturated fatty acids or their glycerides into saturated compounds characterized by the treatment of the mentioned fatty bodies with hydrogen in presence of a finely divided metal acting as a contact substance.

Translation.

German patent No. 211,669, Class 12 o. Group 11, Dr. E. Erdmann. Process for the Preparation of Saturated Compounds from Non-Volatile or Difficultly Volatile unsaturated Fatty Acids from Their Esters by Hydrogenation in the Presence of Nickel. Patented in Germany as of Date January 19, 1907, Published July 13, 1909.

Through the researches of Sebatier and Senderens, chemical science has been given a method whereby molecular hydrogen may be added to gaseous or easily volatile unsaturated compounds.

877 this method consists in that the unsaturated substances in the gaseous or vaporous condition are led, together with hydrogen, over heated, finely divided nickel. The speed of the reaction is dependent on the height of the temperature. The best temperature for each single substance must be specially determined.

For the technically important hydrogenation of unsaturated fats or their acids, the methods mentioned have not heretofore been appli-

cable, because those substances either are not volatile without decomposition or are volatile only at too high a temperature for the catalytic action of the nickel. Also if, as has been already proposed, one adds freshly reduced nickel powder to oleic acid, heats the mixture and leads in hydrogen, the latter will only be slowly absorbed, and to obtain only a half way complete reduction of the oleic acid requires an extremely long time, and an enormous excess of hydrogen. On the other hand, it has now been found that practically useful results may be obtained, if the unsaturated compounds are introduced at the same time with hydrogen, in drops as fine as possible onto an excessive amount of heated nickel spread out on a large surface and the resulting end products removed as quickly as possible. The new process is continuous and therein there takes place an immediate quantitative addition of hydrogen because small quantities of oil sub-divided upon a great surface of the contact mass are brought into intimate contact with the excess hydrogen gas.

One embodiment of the present continuous contact process consists in that a cylindrical vessel adapted to be heated is filled with
878 nickelized pumice stone, or with nickel-containing porous clay balls, clay fragments, prepared asbestos or similar materials upon whose surface occurs freshly reduced nickel in fine sub-division. Hydrogen enters from the bottom into the hot cylinder, while from above the liquid to be reduced is introduced in fine drops, preferably sprayed through a nozzle by means of hydrogen. In a finely atomized condition, the liquid behaves itself toward hydrogen addition as if it were in the gaseous or vaporous form. It saturates itself almost instantaneously with the counter flowing hydrogen under the catalytic action of the nickel pumice stone heated to the right temperature. The newly produced saturated compound collects in the molten condition in the bottom part of the cylinder, and is there drawn off in the same amount as it is introduced at the top in the form of droplets. The process proceeds in this way without interruption. The activity of the nickel continues completely unweakened for a long time as has been experimentally demonstrated. This process permits a quantitative conversion of oleic acid into stearic acid and distinguishes itself thereby advantageously from the known hydrogenation of oleic acid with the aid of the electric glow discharge by which only 40% of the oleic acid can be converted into solid products.

Catalytic action under the described conditions is so intensive that even highly unsaturated and extremely difficultly reducible acids such as linoleic and linolenic acid are smoothly converted into stearic acid. It is not absolutely necessary to atomize the liquid through a nozzle. One can also allow it to drop from fine tubes in small droplets. Solid fats which are to be reduced must naturally be melted beforehand, and by the addition of heat kept in the melted
879 condition. The temperature of reaction can vary within wide limits. In the following examples the temperature was most favorable from 160° to 200°.

Example I.

In a heatable closed cylinder made of nickel is arranged an inner clay cylinder revolvable about a vertical axis, which clay cylinder is impregnated with finely divided freshly reduced nickel. Through a laterally introduced nozzle oleic acid is atomized by the aid of compressed hydrogen, and sprayed against the slowly revolving clay cylinder (heated to 180°). The stearic acid dripping off passes on through a layer of nickel pumice stone and is then drawn off through an outlet pipe in the bottom of the apparatus.

Example II.

A tower made of nickel and fitted with a heating device is filled with clay fragments which are impregnated with nickel oxide, and this tower is closed by a cover. The nickel oxide is reduced at 280° by introduced hydrogen. Then one allows the temperature to sink to 170° to 180° and introduces through the cover oleic acid which is uniformly distributed by means of a distributing sieve in the inside of the apparatus, this distributing sieve being made out of fine tubes. A current of hydrogen is introduced from below in counter current to the down-trickling oleic acid. When it reaches the bottom, the oleic acid has been reduced to stearic which flows off through an outlet pipe. From chemically pure oleic acid there is obtained a pure stearic acid of melting point of 69°, from commercial oleic acid a stearic acid which solidifies at about 60°. The excess hydro-
880 gen gas leaves the apparatus in a pure condition through an outlet pipe located in the cover; it is collected and used again. In an experiment carried out quantitatively from 470.6 gr. oleic acid there were obtained 466.6 gr. stearic acid, that is 98.5% of the theoretical.

Example III.

If in example I or II, in place of oleic acid there is employed pure linolenic acid ethyl ester, one obtains stearic acid ethyl ester of melting point 33.5°.

Example IV.

In Example II, the oleic acid was replaced by low melting tallow of the solidification point 31°, the product was a harder tallow of the solidification point 38°.

Patent Claim.

Process for the production of saturated compounds from non-volatile or difficultly volatile unsaturated fatty acids or their esters by hydrogenation in the presence of nickel, having the characteristic that the unsaturated substances in the atomized form or in the form of fine drops, simultaneous with hydrogen, are brought in contact

with finely divided nickel, and the saturated compounds are drawn off to the extent of their formation.

881 *Translation.*

Journal of the Russian Physical Chemical Society.

Volume 38 (1906) pages 855-858.

To the article: Role of Hydrogenated Metals in Reactions of Reduction, etc. (Journal of the Russian Physical-Chemical Society, 38 (1906), page 416.) By Fokin.

The idea enunciated by me that the hydrogen of a hydrogenated metal possesses the character of a physically compressed gas was confirmed by the following experiments,—in work with sealed tubes. Pressure exerted externally, as was to be expected, further contributes to our reaction, and thanks, to this, it is possible to decrease the temperature at which it takes place. If at ordinary atmospheric pressure—with nickel, for instance,—a temperature of about 200° was required, now under the new conditions one of 100° appeared to be sufficient, at least with a pressure of about 35 atmospheres.

These results entirely agree also with the observations of Prof. Ipatieff.

The resources of our laboratory compelled me for the time being to confine myself to the following disposition of the experiments.

Into a glass tube bent in the manner shown there is put first zinc (or iron) in the form of shavings or filings and is covered with water; then there are introduced a few pieces of paraffin and on carefully heating the tube they float. Then, after the setting
882 of the paraffine, there is poured in sulphuric acid of 1 to 3 or 1 to 4 in excess of the calculation. (It is advantageous to add some copper sulphate.) Above the acid follows again a layer of paraffin. In the horizontal part of the tube there is placed oleic acid and nickel reduced from its sub-oxide at 300°.

A solvent is absolutely unnecessary.

The vertical part of the tube (B) was heated either in water vapors, or was inserted in a boiling saturated solution of kitchen salt. The horizontal part (A) was introduced into an air bath, heated up to the desired temperature. The asbestos in C prevents the possibility of paraffin entering the part A of the tube.

There was taken such an excess of zinc (or iron) with the H_2SO_4 that only a part of the zinc entered into re-action, i. e., a maximum of pressure was attained corresponding to a given equilibrium in the condition of the system.

(1) 6 gr. of oleic acid were heated with 4 gr. of *Ni.* up to 154°-150°. After 8 hours a product was obtained with a solidifying point of 54.5°.

(2) 8 gr. of oleic acid + 3.5 gr. *Ni.* After 3 hours a product was obtained which solidified it 46.5°.

The nickel produced in the electrolysis of nickel sulphate, and also thin nickel wire or shavings do not provoke any reaction or reduction whatever.

Cobalt (4 gr.), after heating for a period of 5 hours up to 150° with 8 gr. of oleic acid, gave a product with a solidifying point of only 23°-24°.

Palladium, on the contrary, in the proportion of 5% and under the same conditions gives a product with a solidifying point of 61°.

883 In order to determine the influence of pressure, we proceeded thus: in a wider tube sealed at one end (Fig. 2) there was introduced first *Zn*, and after dividing it off by a layer of paraffin, there was poured in dilute sulphuric acid (and, as always, a little $CuSO_4$).

Thereafter there was introduced a thin walled tube of somewhat smaller diameter, containing oleic acid (1 gr.) and nickel (25 gr.); the upper end of this tube was so contracted that the opening whereby its interior space communicated with that of the exterior wide tube, was very small, in order to be more or less insured against the intrusion of paraffin.

This tube enters with some friction and therefore can be fixed at the desired height.

1) Upon heating only the lower part of the tube up to 100°, at an ordinary temperature for the upper part and at a pressure of 26 atmospheres,—the reaction does not proceed.

2) Upon heating the whole tube up to 100° and at a pressure of 35 atmospheres, after 20 hours, a product was obtained with a solidifying point of 45°-44°.

3) At a temperature of 100° and a pressure of 60 atmospheres after 12 hours a product was obtained with a solidifying point of 64°-62°.

The absence of stirring acts very disadvantageously; thus in one case it appeared that the upper layer was still liquid at ordinary temperature, while the lower one melted at above 60°.

884 The reduction of glycerids proceeds worse than that of free acids, but nevertheless it is not difficult to convert linseed oil or any other drying oil whatever into substances with small iodine numbers, at first into products of the type of sunflower oil or poppy oil, and then into products analogous to sesame oil or cotton-seed oil.

Almond and olive oil undergo a metamorphosis into fats corresponding to beef or mutton drippings.

Oils with large iodine numbers require a longer time, but at the final end they also give solid fats. If to the method here described there is due the right of citizenship in industry, then liquid vegetable oils will prove as satisfactory a material for saponification as animal fats.

The solid glycerid from castor oil also deserves attention. If the purgative properties of the latter are conserved in the new preparation (1) then its use in place of the recently patented solid castor oil (2) has an undoubted advantage.

I consider it not superfluous to communicate here some data concerning the occlusion of hydrogen by metallic nickel.

A preparation of suboxide of nickel, which on heating does not set free water, was reduced in a stream of hydrogen for not less than 6-8 hours. After that the temperature was decreased down to 80°-90°, and a stream of dry hydrogen was passed through for 3 hours more, controlling the dryness of the gas going out off the tube by the added weight of a chlor-calcium tube. The determination itself is based upon the following observation: the formation of water at the expense of hydrogen of the hydrogenated metal and of oxygen (even the *O* of the air) proceeds very promptly and easily at a relatively low temperature. Therefore, if it is brought
885 up to 120°-130°, then the passing through of air for a few minutes is sufficient to obtain constant numbers in the added weight of the calcium chlorid tube. One determination gave me 160 and another more than 200 volumes of hydrogen to one volume of metal.

1) According to the existing representation, they are conditioned by the presence of the group OH and by the capacity that it determines of forming a perfect emulsion.

2) Magnesium salt of the fatty acids of the oil.

Thus my opinion of the incorrectness of Glaser's conclusions is here once more concretely confirmed.

Entirely similar to oleic acid is the behavior of dimethyl allyl carbinol, kindly placed at my disposition by Prof. A. A. Albitzky.

Translation.

Journal of the Russian Physical-Chemical Society.

Vol. 39, pages 607-609, year 1907.

To the Article: The role of hydrogenated metals in reactions of reduction (Journal of the Russian Physical-Chemical Society, Vol. 38 (1906) page 416). By Fokin.

885 The reduction of erucic acid proceeds very easily in an alcohol (but not in an aceton) solution.

Mesaconic and itaconic acids are also reduced very easily by electrolysis, both of them giving an inactive acid.

Croton oil. The liquid fatty acids from it, carefully separated from the solid ones, give, on being reduced, stearic acid which in spite of all methods of fractionation, does not give fractions melting above 68°, or with a congelation point above 65.5° although their molecular weight corresponds to the theoretical one.

In working upon fatty acids with bromine (in CCl_4) there is separated a crystalline product with a melting point of 113°-114°, which corresponds to tetrabromstearic acid. In oxidising them by manganese potassium salt in a basic solution (according to the indi-

cation of Gatsura and Saitsof) there is obtained apparently only tetraoxystearic acid. But by crystallization it can be divided into two portions. (1) With a melting point of 170°-169°, which is normal, and (2) with a melting point of 141°-142°, approaching that of dioxystearic acid, but with a molecular weight (343.7) corresponding to tetraoxyacid.

In the solid fatty acids there was found myristic acid.

Croton oil does not give the elaidin reaction, exactly for the reason that it contains more unsaturated acids, than those of the oleic series.

Hydrogenated Cobalt. When taken in excess, reduces at 270° and at ordinary pressure, oleic acid to the content of 28-26% of stearic acid (with a solidification point of 54.8°).

In a closed tube the reduction at the same temperature proceeds more easily.

887 Oleic acid has been reduced to a content of 60%, almond oil to a content of 74 to 80%, also calculated on the basis of stearic acid of 54.8°, as in all the exposition that follows:

Palladium black at the ordinary temperature in passing hydrogen through the solution (for instance in sulphuric ether) gives as soon as after ½ an hour stearic acid with a congelation point of 60°.

Platinum black in the same conditions as palladium, gives:

After ½ an hour a product containing 24% stearic acid of 54.8°.

After 3½ hours a product containing 84.5% stearic acid of 54.8°.

After 5 hours a product containing 90% stearic acid of 54.8°.

Nickel reduced from the suboxide with a long passing through of hydrogen (at 300°-280°).

It was most convenient, as with Cobalt, to accomplish the reduction of oleic acid, after dissolving it in valerianic acid or fatty acid. Although a portion of the metal (particularly with Cobalt) dissolves, nevertheless, with a certain excess of it, that does not reflect upon the results. A stream of hydrogen was always being passed through.

At 184°-185°. After ¾ of an hour a product is obtained with 18.3% stearic acid (54.8).

At 170°-173°. After 1 hour a product is obtained with 26.24% stearic acid (54.8).

At 170°-173°. After 3 hours 20 minutes a product is obtained stearic acid (54.8).

At 170°-173°. After 4 hours 20 minutes a product is obtained with 7-4% stearic acid (54.8).

At 97°. After 1¼ hours a product is obtained with 32-31% stearic acid (54.8).

888 At 97°. After 4 hours a product is obtained with 95-90% stearic acid (54.8).

At 45°. After 2 hours a product is obtained with 16-15% stearic acid (54.8).

At 45°. After 2½ hours a product is obtained with 23-21.5% stearic acid (54.8).

At ordinary temperature the reaction does not proceed.

That the passing through of hydrogen plays an important role is shown by the following:

1) With passing through of CO_2 at a temperature of 97°. After 2 hours there was found 7-6.5% stearic acid.
After 4½ hours there was found 32-31% stearic acid.

2) Experiment in the same conditions, but with passing through of hydrogen:
After 1 hr. 10m. 16-15% stearic acid.
After 2 hrs. 20m. 42-40% stearic acid.
Cobalt reduced from a suboxide and after a seven hours' long passing through of hydrogen at 310-330°.
There was taken a great excess of cobalt. A hydrogen stream was being passed through. As solvents were taken valerianic and fatty acids.
At 250°-240°. After 1½-1¾ hrs. were found 32-31% stearic acid.
At 160°-155°. After 1 hr. 20 m. were found 31-26% stearic acid.
At 98°. After 1 hr. 40 m. were found 6-5.5% stearic acid.
At 50°-48°. After 2½ hrs. were found 0 stearic acid.
Kharkow, 29 Jan., 1907.

889 *Translation.*

The Catalytic Effects of Colloidal Metals of the Platinum Group.

IV. Reduction Catalyses with Colloidal Palladium. By C. Paal and K. Roth. Berichte der Deutschen Chemischen Gesellschaft. Vol. 41, pp. 2282-2291. Pub. at Berlin, Germany, July 11, 1908.

"In the previous communication, the reduction of certain unsaturated acids by means of colloidal palladium hydride was described. We have continued the investigation to include the high-molecular oleic acid and a mixture of unsaturated glycerin esters of saturated and unsaturated aliphatic acids such as occur in vegetable and animal fats and oils.

Reduction of Oleic Acid.

Oleic Acid, $C_{18}H_{34}O_2$, is reduced by ordinary reducing agents not at all or only with difficulty. Only by means of hydriodic acid and phosphorus has it been found possible to transform it into saturated stearic acid, $C_{18}H_{36}O_2$. It has recently been discovered, however, that this hydrogenation can also be accomplished by cathodic reduction using cathodes which have been platinized or prepared with palladium black, but the course of this reaction and the yield of stearic acid apparently varies greatly with cathodes made of different metals and depends greatly upon the precise experimental conditions. Moreover, S. Fokin has been able to obtain a 90% yield of stearic acid by conducting hydrogen into an etherial solution of oleic acid in the presence of palladium black or platinum black.

890 More recently, R. Willstaetter has carried out this reaction successfully for the reduction of a number of organic substances including oleic acid ester. He used platinum black

prepared according to the method of Low [Berichte, 23,289 (1890)] the great activity of which is evidently due to the presence of solid platinum hydrosole for Low states that the platinum black precipitate after the electrolytes are all washed out, passes through the filter as a dark colored liquid.

By using the colloidal palladium prepared by the process of Paal and Amberger [Berichte, 37, 124 (1904); 38,1398 (1905)] oleic acid may be reduced, just as the lower members of the unsaturated acid series (see Paal and Gerum), to stearic acid at the ordinary temperature; the yield is good.

Experiment I. As the sodium salt of oleic acid is difficultly soluble in water, we used for the reduction the more readily soluble potassium salt. 0.5g. of pure oleic acid (from Kahlbaum) was treated with the quantity of caustic potash solution which was theoretically necessary to form the potassium salt and the solution was diluted with water to a volume of 10 cubic centimeters. As catalyser in this and the following experiments, a palladium preparation with 61.16% of colloidal palladium was used. To the solution of the potassium oleate, 0.081g. of this palladium preparation was added (=0.05g. Pd) which was dissolved in 8cc. of water. The mixture was transferred to a gas burette containing 67cc. of hydrogen (18.5° and 733mm.) and from time to time the volume of hydrogen absorbed was read.

Time in Minutes 5, 10, 20, 32, 87, 147, 207, 327, 387, 627, 867.
Cc. Hyrogen 2.2., 4, 6.8, 16.5, 19.8, 21.6, 26.8, 32.6, 34,4, 38.2, 40.6.

891 At the beginning of the experiment the volume of the hydrogen gas was 59.05cc. (0° and 760mm), at the end of the experiment it was 23.05cc. (0°, 760 mm), making an absorption of 36cc. of hydrogen. The burette was refilled with hydrogen and at the end of 5 hours an additional 1.2cc. was absorbed making a total absorption of 37.2cc of hydrogen.

0.5g. of oleic acid should theoretically absorb 39.4cc. of hydrogen. There was, therefore, 94% of the theoretical quantity of hydrogen catalytically transferred to the oleic acid.

During the reduction the soap solution (i. e., the solution of sodium oleate and stearate) steadily became more viscous. We rinsed it out of the burette with water, warmed to make it less viscous, and acidified with dilute sulfuric acid, whereby the stearic acid and the absorption compound of the colloidal palladium with free protalbic acid were precipitated in crystalline masses, colored black by palladium, these masses were filtered off, washed, dried and then treated with chloroform, which dissolves only the stearic acid. To extract all the oleic acid the mass was boiled with chloroform several times.

After distilling off the solvent, the reduction product was obtained as a brittle, white, radiantly crystalline mass which, after being recrystallized once from a little alcohol, melted at 65—57° C. The product weighed 0.446. After again recrystallizing, the melting point was 69.2° which is that of pure stearic acid.

II. 2 grams of oleic acid as potassium salt and again 0.081 gram of colloidal palladium (=0.05g. Pd) were dissolved together in

22cc. of water in the "shaking tube" which was connected
892 with the gas burette and was filled with hydrogen and which during the progress of the reaction was kept in constant motion by a shaking machine. The absorption of the hydrogen was determined by reading the gas burette.

At the beginning of the experiment the absorption was very lively as a result of the shaking as inspection of the following values will show:

The original volume of the gas in the burette was 86cc. (15°, 729mm).

Minutes	4,	6,	9,	12,	15,	21,	30,	43.
CC.H	12.4,	27.4,	38.4,	44,	48.8,	58.4,	69.8,	78.

At the last there was still 8cc. of hydrogen remaining in the burette (15°, 729mm). There was therefore, an absorption of 78cc. of hydrogen (=69.4cc. at 0° and 760mm). The burette was refilled with gas and 21cc. more of hydrogen was absorbed in an additional 2.5 hours. Then the colloid suddenly separated out and the absorption stopped. Then a fresh portion of colloid (=0.03g. Pd) was added dissolved in 5cc. of water, and at the end of 12 hours more an additional 38cc. of hydrogen was absorbed (uncorrected volume). Once more the colloid was deposited and the absorption stopped and the experiment was not continued. In all 113.55cc. of hydrogen was absorbed whereas for the complete reduction of the oleic acid, 157.6cc. of hydrogen are demanded theoretically. The reduction product was isolated in the same way as in the first experiment. After recrystallization, it weighed 1.7g. The yield of pure stearic acid of melting point 69.2° was about 60% of the theoretical. The
893 chemical analysis showed 75.88% C, 12.69% H. stearic acid according to theory contains 76.05% C and 12.68% H.

The Reduction of the Fats.

The animal and vegetable fats and oils are, as is well known, mixtures of the glycerine esters of saturated and unsaturated fatty acids; some of them contain in addition the glycerine esters of unsaturated oxy-fatty acids. The ratio in which the glycerine esters are present in the separate fats is only relatively constant, it varies within certain limits. All fats without exception contain glycerides of unsaturated acids in the presence of glycerides of the saturated acids. The amount of glyceride of unsaturated acids is determined on the basis of the quantity of iodine or chlorine which they will take up.

The Hubl Iodine Number, which gives the quantity of iodine in per cent. of the amount of fat under certain definite conditions and which in food chemistry plays an important part in detecting adulteration and in the identification of the fats, is, within certain limits, constant for each individual fat. According to the amount of glyceride of unsaturated acid contained in a fat the iodine numbers of different fats varies between 8 and 180%.

Whereas the fats, according to their content of glyceride of un-

saturated acids, add on halogen with readiness, they are indifferent toward nascent hydrogen. The use of alkaline and acid reducing agents appear out of the question on account of the saponifying action. Neutral reducing agents, e. g., aluminum amalgam, are, as we have convinced ourselves by an experiment, without action
894 upon fats soluble in alcohol even when the experiment is carried on for weeks, adding a little water from time to time. The hydrogenation of fats has also a technical importance, in case it should prove possible, in a simple and at the same time inexpensive manner, to reduce liquid fats of low value, whose consistence is caused by the presence of glycerides of oleic and other unsaturated acids, to transform these liquid, unsaturated esters into the solid tristearin. Such hydrogenated fats, which consist solely of glycerids of saturated acids have never yet been described in chemical literature. Only in patent literature, by the patent of Leprince and Sieveke (German Patent 141,029) has a process for the hydrogenation of unsaturated fatty acids and fats been described, according to which the fat to be reduced is heated in an oil bath with nickel powder and hydrogen gas is conducted into the apparatus; the process is based upon the method of hydrogenation developed by Sabatier and Senderens. In this way, for example, olive oil is said to have been converted into a tallow-like mass. No data is given to show whether the reduction was complete or not.

The above-described transformation of oleic acid into stearin acid led us to expand our experiments to include the fats also. We chose as our starting material at first two vegetable fats, castor oil and olive oil and an animal fat, cod liver oil, which have high iodine numbers and are therefore rich in unsaturated fatty acids. According to the process used with oleic acid, it was found possible to hydrogenate them practically completely and thereby change them to high-melting, crystalline masses similar to tallow in appearance. By measuring the quantity of hydrogen absorbed and by deter-
895 mining the iodine number of the reduced fats, by the process usually employed in food chemistry, we could follow the progress of the hydrogenation and determine the end of the process.

Castor Oil.

This belongs to the relatively small class of fats which is soluble in absolute alcohol and we have attempted, therefore, to reduce the fat in such a solution which appears possible inasmuch as our colloidal palladium preparation in concentrated aqueous solution can be diluted largely with absolute alcohol without precipitation; the colloid therefore is not only a hydrosole but an alcosole as well. It was soon found, however, that when a little water was added to the alcoholic solution of castor oil, even as little water as was necessary to dissolve the solid palladium preparation, that the oil was to some extent precipitated. This could be prevented, however, by the addition of a little ether but this should be done very cautiously as an excess of ether will precipitate the palladium.

Experiment I. 0.5g. of castor oil was dissolved in 13cc. of absolute alcohol, to this 0.081g. of colloidal palladium (= 0.05g. Pd) dis-

solved in 6cc. of water and 6cc. of pure ether was added and the mixture was transferred to a gas burette containing 49.6cc. of hydrogen (18°, 735mm.) = 43.96cc. at 0° and 760mm. Owing to the vapor pressure of the mixture of water, alcohol and ether, the volume of the gas was increased to 64.8cc. but soon the volume of gas began to diminish steadily by absorption.

Time in min. 3, 6, 10, 15, 35, 120, 240, 240, 360.
Absorbed Hydrogen in cc. 4.8, 16, 21.8, 24.8, 30.8, 42.2, 43.8, 46, 50.5.

896 The calculation of the normal volume of hydrogen absorbed was made with due regard to the partial pressure of ether-alcohol and of water vapor in the proportions of the three solvents present. It was found that 32.86cc. of hydrogen (0°, 76mm.) had been absorbed. The original castor oil had an iodine number of 84.4 and assuming 1 atom of iodine equivalent to one of hydrogen, it should have absorbed 36.8cc of hydrogen. During the reduction a part of the hydrogenated fat had separated out on the sides of the burette in a crust, colored black by palladium. After the alcoholic-etheral solution had been expelled from the burette, this crust was dissolved in warm chloroform, the united liquids were evaporated and the black, solid residue was repeatedly boiled up with portions of chloroform. The solvent was evaporated off and the crystalline, slightly yellowish tallow was completely freed from chloroform in a vacuum. The yield of this mass was quantitative.

The hydrogenated fat began to soften when heated to 69° and was melted at 77°. It is difficultly soluble in hot alcohol, easily soluble in chloroform and more soluble in carbon bisulfide. By slow separation from an alcoholic solution three different fractions of crystals were obtained. The iodine number was 1.9. The hydrogenation of the fat was, therefore, nearly complete.

Experiment II. In this experiment, without addition of ether, 1g. of castor oil was dissolved in 25cc. of absolute alcohol and to it 0.081g. of colloidal palladium (0.05g. Pd) dissolved in 4cc. water was added. There was only a very slight deposition of oil. Instead of the gas burette, this time the shaking tube was used for the absorption.

897 After transferring the solution to this tube, which was filled with hydrogen, the shaking was begun. At the end of 12 minutes about 50cc. of hydrogen were absorbed; the burette was again filled with hydrogen and once more connected with the shaking tube. The absorption of hydrogen now took place more slowly and at the end of 30 hours it ceased altogether. In all, 80.94cc. of hydrogen (0°, 760mm.) were absorbed whereas theoretically 1g. of castor oil should absorb only 73.7cc. of hydrogen in order to be completely hydrogenated.

Soon after the beginning of the experiment, a part of the reduced fat, owing to its slight solubility in alcohol, deposited out in crystalline granules and crusts which consisted essentially of glycerides of oxystearic acid, since oxyoleic acid is one of the important constituents of this vegetable fat.

The isolation of the hydrogenated fat was accomplished in the same manner as in Experiment I. It formed a nearly white, hard, crystalline mass which softened at 77° and melted at 81°. The iodine number was 0.65 or may have been 0 as this would be within the limits of experimental error.

The hydrogenation, therefore, may be regarded as complete from 1 gram of castor oil, 1.02 grams of the reduction product were obtained.

Olive Oil.

Experiments seeking to accomplish the reduction of this fat in solution, as with castor oil, have given up to the present time unsatisfactory results, as by mixing the solution of the olive oil in acetone or in pyridine with the aqueous-alcoholic solution of the colloid, there was, sooner or later, either precipitation of the colloid or of the oil and as a result it was never possible to accomplish a com-
898 plete reduction of the oil. A practically complete hydrogenation of the oil was accomplished, however, by using an aqueous emulsion of the oil.

III. 1g. of olive oil was emulsified with 0.5 g. of powdered gum arabic and 0.75 g. water. The mixture thus obtained could be mixed with any desired quantity of water without any flowing together of the minute oil globules in the emulsion. For the experiment, the emulsion was diluted with 15cc. of water and mixed with a solution of 0.81g. of colloidal palladium (= 0.05g. Pd) dissolved in 8cc. of water. The mixture was sucked into the shaking tube which was filled with hydrogen and it was kept in motion during the experiment. The absorption of hydrogen began immediately and was measured in the gas burette which was attached to the shaking tube. It was found that the fat in the form of an emulsion was hydrogenated much more slowly than when present in a true solution which is easy to understand since the oil in the form of an emulsion offers a much smaller surface to the catalyzer than when it is actually dissolved. At the end of 2 hours only about 30cc. of hydrogen had been absorbed and the absorption had ceased entirely. We now attempted to increase the extent of the absorption by raising the leveling tube, which was attached to the gas burette, so that the hydrogen would be under increased pressure (about 0.33 atmosphere). In spite of this extra pressure, however, there was very little further absorption. Only after placing the shaking tube in hot water and shaking was it possible to start the absorption again. The water was at 60°-70°. An explanation of the effect of heating can be found in the fact that as the hydrogenation takes place, the product formed is solid
899 at the ordinary temperature and separates out in the form of crystals which hinder the action of the colloidal palladium upon the oil. By heating, the crystals are liquified and the hydrogenation again starts. In this way, and with an excess pressure of 0.33 to 0.5 atmosphere 224 cubic centimeters of hydrogen (0°, 760mm.) were absorbed in about 9 hours after which there was no

perceptible absorption. On cooling the original drops of fat separated out partly in the form of hard lumps and partly as very fine granules enclosing metallic palladium. The liquid was then rinsed out of the shaking tube and the crusts adhering to the sides of the tube were dissolved in hot alcohol and chloroform. To separate the reduced fat from the gum arabic, which was hard to filter, and from the colloid, a little hydrochloric acid was added and the mixture was heated on the water bath whereby the precipitated palladium and particles of fat gradually rose to the surface, united into larger drops which on cooling became solid again and could be separated by filtration from the gum arabic solution.

To isolate the reduction product, we dried it in a desiccator, and then boiled it up with chloroform. After distilling off the solvent, the hydrogenated fat remained behind as a white, crystalline tallow, which softened at 43° and was melted at 47°. It dissolved with difficulty in hot alcohol and ether but readily in carbon disulfid or in chloroform. From a mixture of alcohol and chloroform recrystallization of the fat gave globules with radiant fibers. The yield was quantitative. The iodine number of the hydrogenated fat was 9; this shows that the original oil had been hydrogenated to a considerable degree but that complete hydrogenation had not
900 taken place by any means. This was surprising as 1 gram of olive oil, with iodine number 81-82 theoretically requires but 71.8cc. of hydrogen for its complete reduction. It has been already mentioned that 224cc. of hydrogen were absorbed by the oil which corresponds to more than three times the volume theoretically demanded.

We assumed, at first, that there had been leakage of hydrogen gas. The apparatus was tested and found to be tight. The assumption that the gum arabic was itself hydrogenated also proved untenable, as a separate experiment with 0.5g. of the gum and 0.081g. of colloidal palladium showed that under the same conditions as prevailed in the experiment with olive oil, only 9.6cc. of hydrogen was absorbed. It were conceivable, though hardly probable, that other unsaturated glycerides are present in the olive oil which are not capable of adding iodin so that the hydrogen required as computed from the iodin number will come out too small. We hope to be able later to find out the true explanation.

Other samples of olive oil of different origin gave the same results in hydrogenation experiments so that the excess hydrogen consumption cannot be traced to the presence of an unusual impurity in the oil.

Cod Liver Oil.

In precisely the same manner as with olive oil, hydrogenation of cod liver oil was accomplished.

IV. 2 grams of the oil were emulsified with 1 gram of gum arabic and 1.5 grams of water. The emusion was diluted with water and an aqueous solution of 0.081 g. colloidal palladium was
901 added. Hydrogenation was accomplished as before in a

shaking tube. Time in Minutes 8, 18, 23, 28, 30, cc. Hydrogen Absorbed 30, 65, 80, 83, 85.2.

At the end of half an hour, 77.41 cc. of hydrogen gas (0° and 760 mm.) were absorbed. Then solid particles of fat began to be deposited and the rate of absorption began to slacken. After refilling the gas burette and giving 0.5 an atmosphere excess pressure, the apparatus was placed in hot water and the shaking continued. In 15 hours more, an additional 70.73 cc. (0°, 760 mm.) of hydrogen were absorbed. A third, and four and fifth refilling of the burette and nearly forty hours of shaking finally led to a total absorption of 313.28 cc. of hydrogen.

The original cod liver oil had an iodine number 135.8. From this value, computation showed that 238 cc. of hydrogen should be sufficient for complete hydrogenation. An excess of 75 cc. of hydrogen was absorbed.

The isolation of the hydrogenated fat was accomplished precisely as described under olive oil. The hydrogenated fat was a white crystalline mass, which began to melt at 43° and was completely melted at 45°. The fat dissolved readily in hot chloroform and in cold carbon disulfide, difficulty in alcohol and ether. From chloroform-alcohol it was recrystallized as little globules of united fine needles.

The determination of the iodine number gave the value 3. The hydrogenation, therefore, was nearly complete and the yield was quantitative.

The characteristic color test for cod liver oil obtained with concentrated sulfuric and nitric acids was not shown by the hydrogenated fat. This shows that the lipochromes have also been reduced.

902 *Translation.*

The Catalytic Effects of Colloidal Metals of the Platinum Group.

V. The Reduction of Fats. By C. Paal and Karl Roth. Berichte der Deutschen Chemischen Gesellschaft Vol. 42, pages 1541-53. Pub. at Berlin, Germany May 8, 1909.

In our last communication we have described the hydrogenation of three fats—castor oil, olive oil and cod liver oil—by hydrogen in the presence of small quantities of colloidal palladium prepared according to the method of Paal and Amberger (Berichte 37.124, 38.1398). The hydrogenation of the esters of the unsaturated fatty acids whereby esters of fatty acids were produced, led to a deep-seated change in the properties of the fats, the new products being pulverisable, crystalline masses. A complete hydrogenisation of these three fats, so that a product with O iodin number was obtained, was not successfully accomplished, but nevertheless the quantity of unsaturated acid ester in hydrogenated castor oil was extremely small as its iodin number was only 0.65. The reduction product of olive oil had an iodin number 9; which represented an approximately 90% reduction. The reduced cod liver oil had an iodine number of three, corresponding to 98% reduction

of the unsaturated esters into saturated esters. In continuing these experiments we have attempted to carry the catalytic reduction of the fats to completion. Besides castor oil, and olive oil, which were studied in our first communication, we have experimented with the vegetable fats, croton oil, sesame oil, cottonseed oil, linseed oil as well as animal fats as represented by butter, lard and oleo-
903 margarine. With these fats also it was rare that we could at once accomplish a complete hydrogenation down to an iodin number of 0. But when the partially hydrogenated fats were subjected to another reduction, it was possible, in most cases, to accomplish complete hydrogenation. In accomplishing this, the remarkable fact was established that not only were the glycerine esters of unsaturated acids hydrogenated but also certain other non-fatty, saponifiable, companion substances which are present to a slight extent in the original fats.

In our last communication we stated that the reduced cod liver oil, with its iodine number 3, no longer showed the characteristic color reactions of this oil which depend on the presence of lipochromes. Similar observations were made with sesame and with cottonseed oil; the former after being hydrogenated only gave a faint Baudouin test and the latter gave negative results with the Becchi and Halphen tests. Similarly, the very poisonous croton-oil was converted by hydrogenation into a perfectly non-poisonous tallow.

In contrast to the natural fats, which on standing naturally become rancid more or less rapidly, the hydrogenated fats show an extraordinary stability. After being kept for six months or a year in loosely stoppered bottles they remained entirely unchanged and had no rancid odor or taste.

As hydrogen carrier in our experiments, we used two palladium preparations prepared according to the method of Paal and Amberger, one contained 46.1% Pd. and the other 61.7% Pd. Both preparations, referred to the same weights of palladium, proved equally active. All the fats were used in the form of aqueous emul-
904 sions which were obtained by triturating 1 part of fat with 0.5 part of gum arabic and 0.75 part of water. The emulsions were diluted with water and mixed with weighed amounts of the colloidal palladium also in aqueous solution.

The emulsifying of the solid fats was accomplished after a preliminary melting in a warmed motor. According to whether a good emulsion was obtained the hydrogenation accomplished was more or less complete. With increasing hydrogenation the microscopically-small drops of fat drops of the emulsion solidified more and more, whereupon the absorption of the hydrogen stopped. By warming to 50 or 60°, after the fat drops had liquified, the reduction proceeded further. Similarly, the absorption of hydrogen ceased also when the emulsion breaks down. The partially hydrogenated fats must then be emulsified again.

The reduction of the fats took place in the shaking tube connected with a gas burette (cf. Berichte, 41, 813 [1908]). After the burette and shaking tube had been filled with pure hydrogen, the mixture of

fat and palladium was sucked into the tube avoiding the entrance of any air. In place of the rather primitive shaking arrangement as used by Paal and Gerum, we used now a Hugershoff's shaking arrangement which, by means of wires or twine was connected with one or both of the side arms of the shaking tube so that the latter was given a see-saw motion while it was dipping in hot water. When the contents of the gas burette were used up, it was refilled with fresh hydrogen, and again connected with the shaking tube. This process permits an exact measurement of the quantity of hydrogen catalytically used up. We found again, as mentioned in our former paper, that for the complete hydrogenation of all the fats
905 more hydrogen was required than was theoretically necessary, as indicated by the iodine number of the original fat. In some cases this excess consumption of hydrogen was very considerable. Moreover, we could repeatedly confirm the fact that although more hydrogen had been taken up than was to be expected from the original iodine number, so that one would not have expected any more unsaturated acids to be present, still the hydrogenated fat showed an iodine number, very small to be sure in some cases.

Naturally the simplest way to account for this excess consumption of hydrogen was to assume leakage from the apparatus. This, however, is contradicted by the fact that after awhile the volume of hydrogen remained constant which would not be the case if there was any chance of leakage. For this reason, the only way to account for the excess hydrogen is to assume that some other reduction took place, as, for example, the reduction of glycerides of the oxyfatty acids or a reduction cleavage of the glycerides into aldehyde and alcohol.

Vegetable Fats.

I. Castor Oil.

In this vegetable fat it is certain that glycerides of oleic acid and of an oxy-oleic acid, $C_{18}H_{34}O_3$ are present besides small amounts of stearic acid and dioxystearic acid glycerides.

In our former paper, we described the reduction of castor oil in alcoholic solution, in this way obtaining a fat almost entirely free from glycerides of unsaturated fatty acids and having an
906 iodine number of 0.65. In the following attempt to carry the reduction to an iodine number of 0, we started with an hydrogenated oil which, by reduction in alcoholic solution, already had an iodine number of 15 and was already a brittle, crystalline mass which melted at 68-71°.

For the further hydrogenation 2.2 g. of the fat was emulsified as described above, diluted with a little water and mixed with a solution containing 0.08 g. of colloidal palladium (= 0.037 g. Pd). The total volume of the mixture was 34 cc. It was sucked into the shaking tube and then, after connecting with the shaking machine, the hydrogen absorption was started. During the first hour 14 cc. of hydrogen (21°, 742 mm.) were absorbed. Then the absorption

slackened because the tiny oil drops began to crystallize. In order to liquify them so that they would again be capable of absorbing hydrogen, that part of the tube containing the emulsion was placed in hot water and the shaking was continued. Altogether, in the course of 20 hours 51.7 cc. of hydrogen (0°, 760 mm.) were absorbed. Toward the end of the experiment, a part of the reduced fat had united into large drops which were solid in the cold. The contents of the shaking tube were filtered off through cotton wool, the filtrate and the particles of fat on the sides of the tube extracted with chloroform and also the fat on the filter. Hereby the palladium remained undissolved and was filtered off.

From the nearly colorless solution the chloroform was distilled off leaving behind the hydrogenated fat as a white, hard, pulverizable crystalline mass which softened at 78° and melted at 81°. The fat had almost entirely lost the unpleasant taste of the original oil.

907 The reduction product was readily soluble in carbon bisufide ether and alcohol. The determination of the iodine number gave the value 0. The hydrogenation was, therefore, complete. The yield was quantitative. For 2.2 g. of the partially hydrogenated castor oil with its iodine number of 15 there should theoretically be required only 29 cc. of hydrogen (normal volume). There was therefore an excess consumption of about 20 cc.

II. Croton Oil.

It consists of a large number of different glycerides, of formic, acetic, isobutyric, isovalerianic, oenanthic, lauriel, myristic, palmitic and stearic acids as well as glycerides of the unsaturated tiglic and oleic acids and the not-very-well-known croton-oleic acid. The very poisonous and irritating effect of cotton oil are attributed to the presence of glycerides of crotonoleic acid and in very old samples of the oil the free acid sometimes separates out. For our experiments a freshly-pressed oil with an iodine number of 99.8 was used. Although the oil is soluble in alcohol, we used for our experiments an aqueous emulsion prepared with gum arabic.

1. 5 grams of emulsified croton oil, diluted with water, were mixed with 0.016 gram of colloidal palladium (=0.01g. Pd) and then diluted to 50cc. The reduction took place under constant shaking at first at room temperature and finally at 50-50° C. In order to hasten the action the levelling tube of the gas burette was raised so that the hydrogen was under a pressure of about half an atmosphere. The

908 reduction began at once. It was necessary to refill the gas burette seven times with hydrogen before the reaction stopped.

In the following table the time is given in minutes and the volume of hydrogen absorbed in the hydrogenation is given in cubic centimeters referred to 0° and 760mm. pressure.

Burretteful	I	II	III	IV	V	VI	VII	VIII
Time	20	35	25	30	30	90	140	660
Hydrogen in cc.	51.23	79.96	80.27	71.03	83.85	77.5	85.73	63.22

During the first five fillings of the gas burette, its contents were absorbed in 20-30 minutes, then the rate of absorption slackened and in the last case it took about 17 hours before the reaction ceased entirely. In a little over 17 hours, 592.8cc. of hydrogen (normal volume) were absorbed. At the same time, the quantity of Catalyzer present amounted to only one five-hundredth part of the weight of the oil used. In other words, one volume of palladium had activated 700,000 volumes of hydrogen.

After the reduction was finished, the greater part of the fat had separated out in a solid mass colored black by palladium from which it was separated by extraction with chloroform. The small quantity of fat remaining in the emulsion was also extracted with chloroform.

From the united and dried chloroform solutions, the reduced croton oil was obtained, after distilling off the solvent, as a reddish-brown, hard tallow which began to soften at 40°, melted at 48° and had an iodine number of 4.8. The yield was quantitative.

To accomplish a more complete hydrogenation, 4g. of the product with the iodine number 4.88 was again emulsified and mixed with an aqueous solution of 0.081g. colloidal palladium (=0.05g.
909 Pd). The total volume of liquid was 40cc. In the same way as before, the hydrogenation process was continued for 20 hours longer and then for 5.5 hours it was heated under pressure while shaking. Altogether 48cc. of hydrogen were absorbed.

By isolating in the same way as before, a fat was obtained with much the same outward appearance but melted a little higher, namely, at 49-51° and had an iodine number of 0. It dissolved readily in carbon bisulfide and in chloroform. The original oil was soluble in about twice its volume of boiling alcohol; the hydrogenated product was somewhat less soluble. The reduced fat had entirely lost the terrible burning taste of croton oil.

As it was of interest to study the physiological action of both the partially and completely hydrogenated oil, two other reduction experiments were performed (more complete details of this work may be found in the doctor. Dissertation of Roth which is not available here).

II. In this case 2g. of croton oil were emulsified and reduced as before with the aid of 0.04g. of colloidal palladium (=0.025g. Pd). In 13 hours 173.9cc. of hydrogen were absorbed. The fat isolated from carbon disulfide melted between 39 and 42° and had an iodine number of 15.26.

III. In this experiment 5g. of croton oil was emulsified and reduced with the aid of 0.081g. of colloidal palladium (=0.05g. Pd). After 463cc. of hydrogen (0°, 760 mm.) had been absorbed the process stopped of its own accord. The hydrogenated fat melted at 44-48° and had an iodine number of 5.53.

As 1 gram of croton oil with iodine number 99.8 should only require 87.4cc. of hydrogen for its complete reduction, it is
910 evident that in all these experiments much more than the theoretical quantity of hydrogen had been consumed. Professor Heintz, of the pharmacological Institute at Erlanger, was asked

to study the physiological effect of the partially and of the completely hydrogenated oils and to compare these effects with those of the original oil. Professor Heintz reports to us the following results:

From each of the three fats 10% solutions in olive oil were prepared. Two drops of the solution containing the original oil placed in the eye of a rabbit caused strong reddening and an enormous swelling of the connective tissue while the same quantity of the partially hydrogenated oil caused only a slight reddening and only after repeated application was a marked irritation produced which, however, was decidedly less than that of the original oil used in far less quantity. Administered internally, 0.01g. of croton oil produced strong diarrhœa; 0.025g. led to a bloody discharge of the intestinal membrane causing the death of the animal. On the other hand, the partially hydrogenated croton oil was without noticeable effect when only 0.02g. was administered and ten times as much (0.2) caused the animal to die only after 5 days. The completely hydrogenated croton oil caused no irritation of the eye and when administered internally in very large doses caused no diarrhœa or inflammation with a rabbit or with a dog.

By the complete hydrogenation of the croton oil, the physiological effects characteristic of this oil disappear entirely.

911 III. Olive Oil.

The oil consists essential- of glycerids of oleic, palmitic and stearic acid with small quantities of linoleic and arachidic acid glycerides.

By the reduction of this fat we have obtained, as published in our former communication, a solid product melting at 43-47° with an iodine number 9.

For the complete hydrogenation, which was accomplished in two stages, 2 grams of the original oil (iodine number 81) was reduced in the manner already described and thus a tallow-like product was obtained with iodine number 39.7 in quantitative yield. Of this product, 1.8g. was taken for further hydrogenation. It was emulsified, mixed with an aqueous solution of 0.081g. colloidal palladium (=0.05g. Pd) and the mixture diluted to 37 cubic centimeters. The hydrogenation in the shaking tube took place very slowly toward the last so that, in spite of heating, in spite of steady shaking, and in spite of excess pressure of hydrogen, more than 29 hours had elapsed before the process stopped. During this time 77.68cc. of hydrogen (0°, 760mm.) were absorbed. This corresponds to more than 11cc. in excess of the volume theoretically necessary to accomplish complete hydrogenation.

At the end of the experiment the solid reaction product was extracted in the same way as with the other fats.

The pure, molten fat solidified into a white, crystalline mass which had much the appearance of chalk. It softened at 61° and at 68.5° it was perfectly fluid. It possessed a very slight, pleasantly aromatic taste.

912 The iodine number was 0 and the fat dissolved readily in carbon disulfide and in boiling chloroform but was difficultly soluble in alcohol and in ether.

IV. Sesame Oil.

The chief constituents of this fat are the glycerides of oleic and linoleic acids as well as those of palmitic and stearic acid. The oil used as starting material had an iodine number 108.7.

1. The emulsion prepared from 2g. of the oil was mixed with 0.04g. of colloidal palladium (=0.018g. Pd) and diluted with water to 26cc.

The action of the hydrogen upon the emulsion took place in the shaking tube at ordinary temperatures under an over pressure of 0.33 atmosphere.

Minutes	2,	4,	22,	27,	35,	54,	58,	90
cc. Hydrogen	1.6,	6,	45,	54,	71.6,	84,	99,	125

At the end of this time the fat globules in the emulsion began to solidify so that the tube was placed in water heated to 60°.

In this way, 200.3cc. of hydrogen (0°, 760mm.) were absorbed in 18 hours. The oil theoretically required only 190.3cc. of hydrogen for its complete hydrogenation so that the reaction could be assumed to be complete. The reduced fat was isolated in the same way as before.

After distilling off the extracting agent (chloroform) a pale yellow, brittle mass remained which softened at 59° and gave a clear melt at 69°. The determination of the iodine number gave the value 4.2.

Sesame oil, as is well known, when treated with two drops of a two per cent. alcoholic furfured solution and a volume of concentrated sulfuric acid equal to that of the original oil gives, on
913 shaking, an intensive red color in the cold (Baudoin test).

Our nearly-completely-hydrogenated fat remained unchanged when this reaction was tried in the cold. A pale red color was obtained, however, only when the fat was heated and melted. In comparison to the original oil test, the reaction was very weak. The bodies which are present to a slight extent in sesame oil and cause the Baudoin test are in the form of an unsaponifiable, oily substance of unknown constitution; they were evidently reduced by the hydrogenation.

II. Since the above hydrogenation of the sesame oil was by no means complete, 1.5 g. of the product were again emulsified and mixed with 0.081 g. of colloidal palladium (0.05 g. Pd.) diluted with water to 20 cc. and hydrogenated in the usual manner. In two days 33.24 cc. (normal volume) of hydrogen were absorbed. This was a considerable excess as only 8 cc. should have been required judging from the iodine number. Toward the end of the experiment the emulsion had broken down for the most part and from it particles of solid fat had been deposited.

The isolated fat was white, brittle, almost tasteless with a melting point of 65-69°. It was readily soluble in cold carbon disulfide and

in hot chloroform but was difficultly soluble in ether and in alcohol. To our surprise, however, it was found that the hydrogenation was not yet complete for the product had an iodine number of 2. The Baudouin test was given even more faintly than with the former product. After the product had stood eight months, however, the Baudouin test could be obtained quite distinctly on heating but by no means as strongly as with the original oil. This indicates
914 that the bodies which cause this test tend to become reoxidized, to some extent at least, by means of the oxygen of the air but the hydrogenated fat itself was not appreciably changed.

V. Cottonseed Oil.

It contains the glycerides of stearic and palmitic acid as well as of the unsaturated oleic, linoleic and linolenic acids.

The oil used in our experiments had an iodine number 104.3.

1. For the reduction 5 g. of the oil were emulsified, mixed with a solution of 0.081 g. colloidal palladium (=0.037 g. Pd.) and diluted with water to 40 cc.

The hydrogenation took place, under an excess hydrogen pressure and on shaking, fairly quickly in the cold. In 13.75 hours 460.44 cc. of hydrogen were absorbed (normal volume) and it was necessary to refill the burette six times. As the fat was now hydrogenated to a considerable degree, the fat globules began to solidify out of the emulsion and for that reason, no further addition of hydrogen took place. The shaking tube was, therefore, warmed to 70° and the reduction again started. In 17 hours more, 385.33 cc. of hydrogen had disappeared making an absorption of 847.77 cc. in all. On the basis of the iodine number, 456.5 cc. of hydrogen should have been sufficient. In other words, nearly twice the expected volume of hydrogen was absorbed.

The reduced fat had, by this time, separated out for the most part in quickly-solidifying drops, which, as well as that still in the liquid, was extracted with chloroform.
915 The hydrogenated cottonseed oil was a yellowish white, brittle mass which melted at 56-60° and had an iodine number of 1.9. The yield was quantitative.

II. To accomplish complete hydrogenation, 4.5 g. of the fat were reduced further in the same manner. In 21 hours the emulsion absorbed 42.76 cc. of hydrogen (normal volume) whereas theoretically only 5 cc. should have been required.

The fat obtained by this second hydrogenation was an almost tasteless, brittle mass, nearly white in color, which melted at 57-60° and was readily soluble in carbon disulfide and in boiling chloroform but very difficultly soluble in alcohol and in ether. The iodine number was 0.

Cottonseed oil gives the Becchi and Halphene tests which are used in food chemistry for detecting the presence of this oil when used as an adulterant. The cause of the first reaction is the presence

of a small quantity of unsaponifyable constituent which has not been characterized further chemically except that it is capable of reducing an alcoholic-ethereal solution of silver nitrate to metallic silver. The fact that the reaction has taken place is shown by a darkening of the solution. The constituent of cottonseed oil which causes the Halphen reaction (red coloration on heating with a mixture of amyl alcohol and sulfur dissolved in carbon disulfide) is also found in the unsaponifyable part of cottonseed oil. It is not yet certain whether this substance is the same one that causes the reduction of the silver nitrate in the Becchi test.

Both of the hydrogenated products which we obtained from cottonseed oil failed to give either of the above tests. This shows
916 that the unsaponifyable constituents, as well as the unsaturated fatty acids, are acted upon by the catalytic reduction and in this case the effect was permanent for negative tests were obtained even after the products had stood for ten months.

VI. Linseed Oil.

This drying oil contains chiefly glycerides of unsaturated acids (89-90%) and less oleic acid glyceride than glycerides of linoleic and linolenic acids.

The oil used in our experiments had an iodine number 181.7 (Experiment I) 2 g. of the oil were emulsified, mixed with a solution of 0.04 g colloidal palladium (=0.025 g. Pd), diluted with water to 25 cc. and hydrogenated in the usual manner. At the room temperature 154.84 cc. (normal volume) of hydrogen were absorbed in 2 hours. Then we heated to 70° and in 20 hours more an additional 167.69 cc. of hydrogen were taken up, or 322.53 cc. in all. On the basis of the iodine number it was to be expected that only 283 cc. of hydrogen would be needed.

The isolated fat was a hard, white mass, melting at 56-63°, and had the iodine number 5.58.

II. For the further hydrogenation, 1.5 g. of the partially hydrogenized product was emulsified hot mixed with a solution of 0.081 g. colloidal palladium (=0.05 g. Pd) and the mixture diluted to 35 cc. Hydrogenation, in the usual way, was carried out first in the cold, and then at 60-70°C. In the course of 2.5 days 35.13 cc. of hydrogen were absorbed.

The fat isolated after this second experiment was hard, pulverizable, white, soluble in carbon disulfide and in hot chloroform,
917 melted at 61-65° and had the iodine number 0.

Animal Fats.

VII. Butter.

Butter fat is a very complicated substance from a chemical standpoint. There has been detected in it with certainty the glycerides of butyric, capronic, caprylic, capric, lauric, myristic, palmitic and oleic acids. The presence of glycerides of stearic and archidic acids is extremely doubtful.

For our experiments 2 samples of pure butter of different sources were taken. The butter fat was obtained by melting the butter at 60° and pouring it through a dry filter.

I. The first sample of fat had an iodine number 37. 3 g. of it were emulsified, and it was our experience that it is not always easy to prepare a good emulsion of butter fat. The emulsion was mixed with 0.04 g. of colloidal palladium (0.025 g. Pd) and diluted to 25 cc. The addition of the hydrogen took place fairly slowly in the usual manner first at room temperature and finally at 50° C. In 24.75 hours, 113.83 cc. of hydrogen were absorbed (normal volume). Theoretically 97.17 cc. were necessary.

The hydrogenated fat was fairly hard, brittle, white in color, softened at 36° and melted clear at 44°. It dissolved readily in carbon disulfide and in chloroform but with difficulty in alcohol and in ether. The fat had a slight, pleasant, nut-like taste somewhat reminiscent of cocoa butter and quite different from the characteristic taste of melted butter. After standing nine months there was no sign of any change in the product.

918 The iodine determination gave the value 0. In this case, as an exception, the hydrogenation was accomplished all at one time. That this is not always the case with butter was shown by the experiment with a second sample of butter fat having the iodine number 33.

II. 7.5 g. of the fat were mulsified, mixed with a solution of 0.121 g. of colloidal palladium (=0.075 g. Pd) so that the mixture corresponded to 1 part of palladium in 100 parts by weight of fat. The mixture was diluted to 50 cc. and hydrogenated in the usual manner. In 35 hours, 239.92 cc. of hydrogen (0°, 769 mm) were absorbed instead of the theoretical 217.3 cc. In spite of the fact that more than the theoretical quantity of hydrogen had been absorbed, the glycerides of unsaturated acids were not completely hydrogenized, for the iodine number of the fat, which melted at 39.541° was 13.6. 6 g. of the incompletely hydrogenated fat were mulsified anew, mixed with the same quantity of palladium as before, diluted to 50 cc. and treated with hydrogen. In 9.5 hours 71.5 cc. of hydrogen were absorbed (0°, 760 mm). This time the theoretical volume of hydrogen required was 71.4 cc., as computed from the iodine number.

The fat extracted after this second hydrogenation was a white, tallow-like mass of melting point 41-42° with the properties described above and the iodine number 0.

VIII. Lard.

The fat contains the glycerides of palmitic, stearic and oleic acids. For the experiments, a melted and filtered fat of iodine number 52 was used.

919 I. 5 g. of fat were emulsified, mixed with a solution of 0.162 g. colloidal palladium (=0.1 g. Pd) and the mixture diluted to 54 cc.

The reduction took place in the cold quite slowly. In 3.5 hours 40.81 cc. of hydrogen (0°, 760 mm) were absorbed.

Then we warmed the mixture to 50-55° and in 19 hours more 250.47 cc. were absorbed making a total of 291.28 cc. On the basis of the above iodine number, complete hydrogenation would require theoretically 227.6 cc.

The reaction product obtained from the emulsion formed a hard, white, tallow-like mass of melting point 53-59. The iodine number was 0.3 showing that the hydrogenation was practically complete.

II. To make the hydrogenation absolutely complete, 3.5 g. of the last product were emulsified anew and mixed with a solution of 0.081 g. colloidal palladium (=0.05 g. Pd) and water. The total volume was 50 cc. Although from the iodine number 0.3 it was to be expected that about 1 cc. of hydrogen would be sufficient it was found that 69.35 cc. of hydrogen (0°, 760 mm) were absorbed at 60° during 8.75 hours.

The fat thus obtained was a hard, pulverizable, white, nearly tasteless tallow which melted at 56-60° C. and showed an iodine number of 0. It dissolved readily in carbon disulfide and in hot chloroform but was very difficultly soluble in alcohol and ether. After standing ten months it remained absolutely unaltered.

IX. Oleomargarine.

The fat is obtained from beef tallow by pressure and gentle heat. It contains the parts of the tallow that are most readily
920 liquified. Oleomargarine consists of a mixture of glycerides of palmitic, stearic and oleic acids. The glycerides of the last-mentioned acid are present to a greater extent than in the original tallow, while the content of stearic acid glyceride is less.

2 g. of oleomargaine, with iodine number 45, of salve like consistency, were emulsified, mixed with 0.081 gram of colloidal palladium (=0.05 g. Pd) in solution, and diluted with water to 21 cc. At first in the cold, and then, after an hour, at 50°, 128.25 cc. of hydrogen (0°, 760 mm) were absorbed in 17.5 hours. Theoretically only 84.9 cc. were required.

The product, which was obtained in quantitative yield, was white, brittle, crystalline, almost tasteless, softened at 47°, was melted at 55°. It dissolved readily in carbon disulfide and chloroform, was difficultly soluble in alcohol and ether. The iodine number was 1.2.

(Here follow specifications and drawings marked pages 921 to 1013.)

DEFENDANT'S EXHIBIT G 921

UNITED STATES OF AMERICA,

DEPARTMENT OF THE INTERIOR,

UNITED STATES PATENT OFFICE.

To all to whom these presents shall come, Greeting:

THIS IS TO CERTIFY that the annexed is a true copy from the Records of this Office of the File Wrapper and Contents, in the matter of the

Deft's Ex No G.
U.S. Dist. Court
S. D. of N. Y
MAR 22 1917

Letters Patent of

Edwin Cune Kayser, Assignor, to

The Procter & Gamble Company,

Number 1,004,035, Granted September 26, 1911,

for

Improvement in Method for Saturating Fatty Acids or their Glycerids with Hydrogen.

IN TESTIMONY WHEREOF I have hereunto set my hand and caused the seal of the Patent Office to be affixed at the City of Washington, this 3rd day of February in the year of our Lord one thousand nine hundred and sixteen and of the Independence of the United States of America the one hundred and fortieth.

J. T. Newton

Acting Commissioner of Patents.

922

2-437

DIV 31

NUMBER (SERIES OF 1900).
422366

1908

(EX'R'S BOOK). 99 284

PATENT No. 1004035

Name Edwin Cuno Kayser

Assor to The Procter & Gamble Company,

of Cincinnati, Ohio, a corp. of Ohio.

of Cincinnati

County of

State of Ohio

Invention Methods and Apparatus for Saturating Fatty Acids, or their Glycerides with Hydrogen

filed 191

Division of App., No.

PARTS OF APPLICATION FILED.

	ORIGINAL.	RENEWED.
Petition	Mar 11, 1908	, 190
Affidavit	" " , 1908	, 190
Specification	" 20 , 1908	, 190
Drawing 2 Sheets	Mar. 11 , 1908	, 190
Model or Specimen	, 190	, 190
First Fee	Cash $15 Mar. 11. , 1908	, 190
" "	Cert. , 190	, 190
Appl. filed complete	Mar 20 , 1908	, 190
Examined	G. S. Ely Ex Mar 18, 1911	, 190
Countersigned	W. W. Mortimer	, 190
	For Commissioner.	For Commissioner.
Notice of Allowance	March 21 , 19 11	, 190
Final Fee	Cash $20 Aug. 28 , 19 11	, 190
" "	Cert. , 19 0	, 190
Patented	September 26	, 1911

Associate Attorney
Byrnes, Townsend and Brickenstein
City

Attorney George R. Parkinson,
Commercial-Tribune Bldg.
Alfred M. Allen
Cincinnati
Ohio
303 Bell Block,

Name

Patent No 2

Serial No. 422,366.

Serial No.

Date of Patent

2

923

$15 RECEIVED
Ck MAR 11 1908 Z
CHIEF CLERK U.S.PATENT OFFICE.

CINCINATTI, O.

March 10, 1908.

Hon. Commissioner of Patents,

Washington, D. C.

Sir:

Enclosed find application of E. C. Kayser for Method and Apparatus for Saturating Fatty Acid with Hydrogen together with my check for $15.00 in payment of the first government fee.

Respectfully,

George B. Parkinson

MAIL ROOM
MAR 11 1908
U.S.PATENT OFFICE.

P E T I T I O N.

To the Commissioner of Patents:-

Your petitioner, Edwin Cuno Kayser, a citizen of Great Britain, now resident of Cincinnati, in the County of Hamilton and State of Ohio, and whose Post Office address is No. 3553 Bogard Avenue, in said City, County and State, prays that letters patent may be granted to him for the improvement in Methods and Apparatus for Saturating Fatty Acids, or their Glycerides, with Hydrogen, set forth in the annexed specification, and he hereby appoints George B. Parkinson of Cincinnati, Ohio, or his accredited agent, his attorney, to prosecute the accompanying application, to alter or modify the specification and claims therein, as he may deem expedient, to receive any letters patent therefor and generally to act as fully as he could do in the premises.

Witness his hand this 7th day of March, 1908.

Edwin Cuno Kayser.

924

MAIL ROOM
MAR 20 1908
U.S.PATENT OFFICE.

No.422366 Paper No. 1

TO ALL WHOM IT MAY CONCERN:

Be it known that I, Edwin Cuno Fayner, a citizen of Great Britain, now residing at Cincinnati, in the County of Hamilton and State of Ohio, have invented certainnew and useful improvements in methods and apparatus for saturating fatty acids, or their glycerides, with hydrogen, of which the following is a specification.

per A.

Though it is known in a general way that unsaturated fatty acids or their glycerides may be converted into the corresponding saturated compounds by treatment with gaseous hydrogen in presence of certain finely divided metals, acting as catalysers, the process cannot be commercially exploited without special methods and apparatus.

* A

The object of my invention is toprovide such methods and apparatus, and my invention consists in the methods and apparatus hereinafter described and claimed.

* A * A

The principal physical and mechanical considerations affecting the practical working of this process, are:- to bring about and maintain, until the desired transformation be achieved, extensive contact between a mixture of metal and oil and the hydrogen gas, and moreover to produce such friction and impingement, as will enable the gas to penetrate to the recipient metal in spite of the pre-repellant active coating of oil. These conditions are attained by propelling in form of films or spray a comparatively small, but ever changing part of the hot oil-mixture, within an atmosphere of hydrogen.

* A

Whilst this general principle should be embodied in all apparatus employed to the present purpose, there is considerable latitude in constructive de'ail.

The preferred form of apparatus consists essentially

Cls.1.2.

of a closed horizontal cylindrical vessel, adapted to receive the hydrogen gas and to contains comparatively small column of the mixture of oil and catalytic metal, in which cylinder is rotatable mounted a paddle wheel, or a plurality of such wheels, having blades of wire gauze or equivalent material.

In the drawings, Fig. 1 is a vertical longitudinal section of one form of apparatus embodying my invention: Fig. 2 a section on the line 2-2 of Fig. 1; Fig. 3 a section on the line 3-3 of Fig. 1; Fig. 4, a vertical cross section of a modified form of paddle wheel; Fig. 5, a longitudinal section on the line 5-5 of Fig. 4; Fig. 6 an end view of another modified form of paddle wheel; Fig. 7 a longitudinal section on the line 7-7 of Fig. 6; Fig. 8 an end view of another modified form of the paddle wheel; and Fig. 9 a vertical cross section on the line 9-9 of Fig. 8.

The reference character, A, represents the cylinder, whichis mounted upon suitable supports, B, and preferably has dished ends, a. C represents the inlet pipe and D the outlet pipe for the gas, the outlet pipe being sealed at d by a column of oil. E is the charge hole for the oil and metal, and F the discharge tap. G and G are paddle wheels fixed to a shaft H, mounted in bearings h and entering the cylinder through stuffing boxes a'. The paddle wheels are formed of end-plates g, fixed to a sleeve g' keyed to the shaft, andprovided with openings g^2 for admission of gas, and with an inner and outer series of bolt holes for the reception of rods g^3 and g^4 extending longitudinally of the wheel. The inner series of rods is preferably staggered to permit use of a greater number

in a limited area, thereby reducing the lost space. These rods serve as supports for an endless band g5 of wire gauze, which leads alternately over an inner and an outer rod, as clearly shown in Fig. 3.

In Figs. 4 and 5 I have shown a modified form of the paddle wheel, in which a concentric series of wire gauze polygons are substituted for the wire gauze paddle blades. In this form the paddle wheels are provided with a number of concentric series of longitudinal rods g6 and with endless bands g7 of wire gauze. Polygons may be somewhat deficient in agitating action, and I therefore provide a series of peripheral longitudinal scoops g8 carried by the end plates.

In Figs. 6 and 7 I have shown another form of the paddle wheel, in which a series of perforated disks g9 mounted upon the shaft, and connected at their outer peripheries by a series of longitudinal scoops g8, take the place of the paddle blades shown in Figs. 1 to 3.

In Figs. 8 and 9 I have shown another form of paddle wheel, in which a series of concentric gauze cylinders, g10, is mounted about the shaft and supported at regular distances by concentric perforate spacing rings, g11, connected by bolts g12. The outer rings carry longitudinal agitating scoops g8.

In operation, the bottom of the containing cylinder is supplied with a limited quantity of the mixture of fatty matter and catalytic agent, destined to be engaged by the peripheries of the paddles, which latter, in their rotation, carry a series of films of such mixture through the hydrogen, and in intimate and sustained contact therewith.

927

wheels
The paddle/ are revolved at a speed appropriate to the diameter of the machine, to the number of paddles, and to their particular construction. The best speed must be ascertained empirically. When the hydrogen is supplied under pressure, a lower speed, than would otherwise be required, will answer the purpose.

When working under ordinary pressure, the supply of hydrogen need only be such as to prevent formation of a vacuum within the machine, but a slight excess is generally allowed to pass through and escape from the apparatus, so that steam and gaseous by-products, incidentally generated, may be carried away. When, instead of pure hydrogen, a gas mixture is employed, such as "water-gas", the current must be sufficiently strong to prevent undue accumulation of the indifferent constituents of such gas mixture, notable carbon monoxide, which might otherwise retard or entirely arrest the process.

When pure hydrogen is used under artificial pressure, the gas outlet should be closed by a weighted valve, and the gas supply so regulated as to constantly maintain the desired pressure; but, if "water-gas", or the like, is to be used under pressure, it will be necessary to periodically relieve the pressure by blowing off the inert gas accumulated within the apparatus.

The temperature of the oil and metal mixture may vary within considerable limits, a temperature from 150 to 160° C. will, as a rule, be found suitable. Such temperature may be imparted by any desired means, preferably by means of a steam jacket, surrounding the vessel.

Par A

The time of treatment will vary with the progress

4

realized and with the degree of saturation aimed at.

I claim as my invention:

9

(1) An improved method of treating with hydrogen a unsaturated mixture of fatty acids or their glycerides and catalyser, which consists in bringing films and spray or such mixture into sustained and vigorous contact with a surrounding atmosphere of hydrogen or of a gas-mixture, containing hydrogen.

(2) An improved method of treating with hydrogen a unsaturated mixture of fatty acids or their glycerides and catalyser, which consists in bringing films and spray or such mixture into sustained and vigorous contact with a surrounding compressed atmosphere of hydrogen or of a gas-mixture, containing hydrogen.

(3) Apparatus for treating with hydrogen a mixture of fatty acids or glycerides and catalyser, consisting substantially of a closed cylindrical vessel, with gas inlet and outlet, and of a member mounted to rotate therein, whereby the fluid mixture is converted into films and spr

(4) An apparatus for treating with hydrogen a mixture of fatty acids or glycerides and catalyser, consisting substantially of a closed cylindrical vessel, provided with gas inlet and outlet and with openings for charging and discharging, and a star-shaped paddle wheel, mounted to rotate therein, the vanes whereof are formed of wire-gauze.

Witnesses.

W. W. Symmes

Agnes B. Grant

Edwin Cuno Rayner.

929

OATH.

State of Ohio, }
County of Hamilton. } ss.

Edwin Cuno Kayser, the above named Petitioner, being sworn, deposes and says that he is a citizen of Great Britain and now resident at No. 3553 Bogart Avenue, in the City of Cincinnati and State of Ohio; that he verily believes himself to be the original, first and sole inventor of the improvement in Methods and Apparatus for Saturating Fatty Acids, or their Glycerides, with Hydrogen, described and claimed in the annexed specification; that he does not know and does not believe that the same was ever known or used before his invention or discovery thereof; or more than two years prior to this application, or patented in any country foreign to the United States on an application filed more than twelve months before this application or in public use or on sale in the United States for more than two years prior to this application; and that no application for patent on said improvement has been filed by himself or his representatives or assigns in any country foreign to the United States.

Edwin Cuno Kayser

Sworn to before me and subscribed in my presence this 7th day of ~~February~~ March, 1908.

W W Symmes

" Notary Public in and for Hamilton County, Ohio.

7 M.U.

930

R.

ADDRESS ONLY THE COMMISSIONER OF PATENTS, WASHINGTON, D. C.

2--179. 422366

DEPARTMENT OF THE INTERIOR

UNITED STATES PATENT OFFICE

WASHINGTON, D. C., March 11, 1908

, 191

Sir:

I have to acknowledge the receipt of your informal application for Patent the title of which is improvement in Methods and Apparatus for Saturating Fatty Acids, or their Glycerids With Hydrogen

This application is informal because your signature to the specification has not been attested to by two witnesses as required by the Office Rules. It will be returned for such signatures upon receipt of a written request.

The filing fee of $15 has been received.

Very respectfully,

E. B. Wilson

Commissioner of Patents.

Edwin Cuno Kayser,

C/o George B. Parkinson,

Commerical Tribune Bldg.,

Cincinnati, Ohio.

NOTE.—In order to constitute an application for a patent, the inventor is by law required to furnish his petition, specification, oath, and drawings (where the nature of the case admits of drawings) and to pay the required fee.

No application is considered complete, nor can any official action be had thereon, until all its parts, as here specified, are furnished in due form by the inventor or applicant. 42 2-1908

Spec'n and oath rec'd Mar. 17, 1908.

MAIL ROOM
MAR 16 1908
U.S. PATENTOFFICE.

422366

931

CINCINNATI, O. March 14, 1908.

Hon. Commissioner of Patents,

Washington,

D. C.

Sir:

Please return the specification in the application of Edwin Cuno Kayser, for Method and Apparatus for Saturating Fatty Acids or their Glycerides with Hydrogen, for signatures of witnesses.

Respectfully,

George B. Parkinson.

MAIL ROOM
MAR 20 1908
U.S.PATENT OFFICE.

422366

CINCINNATI, O.

March 18, 1908.

Hon. Commissioner of Patents,
Washington, D. C.

Sir:-

I return herewith specification in re application of Edwin Cuno Kayser for Methods and Apparatus for Saturating Fatty Acids with Hydrogen, with the signature witnessed.

Respectfully,

George B. Parkinson

Div. 3 Room 159 — 2-280 — Paper No. 1

"The Commissioner of Patents, Washington, D. C.," and not any official by name.

All communications relating to application should give the serial number, date of filing, title of invention, and name of the applicant.

NDE

DEPARTMENT OF THE INTERIOR

UNITED STATES PATENT OFFICE

WASHINGTON, D.C., May 18, 1908.

MAILED * * *

Edwin Cuno Faysen,

C/o George B. Parkinson,

Commercial Tribune Bldg.,

Cincinnati, Ohio.

Please find below a communication from the EXAMINER in charge of the application of your

No. 422,366, Methods and Apparatus for Saturating Fatty Acids or their Glycerides with Hydrogen, filed March 20, 1908.

E. B. Moore.

Commissioner of Patents.

1-280

The drawing should show the steam jacket.

Claims 1 and 2 are informal in that each is alternative in form. They appear to contain patentable matter.

The process and the apparatus are subject matters for separate applications and division is required between claims 1 and 2 and claims 3 and 4. However, claims 3 and 4 are not patentable over the following:

Bocking, 55,994, July 3, 1866;

Niecke, 701,619, June 3, 1902 (48-134);

Snodgrass, 100,080, February 22, 1870;

Douglas, 104,126, June 14, 1870;

Stombs, 166,427, August 3, 1875 (48-165).

Claims 3 and 4 are rejected.

A.A.C.

Ely
Examiner.

933

MAIL ROOM
MAY 3 1909
U.S.PATENT OFFICE.

U.S.Patent Office, Serial No. 422,366
RECEIVED
MAY 4 1909 A
Division 31, Paper No. 2

In re Application of
Edwin C. Kayser, for
Methods of Saturating Fatty Acids,
filed March 20, 1908,
Serial No. 422,366.

Hon. Commissioner of Patents,

Washington, D. C.

Sir:-

Response to Action of May 18, 1908.

This application is amended as follows:

In line 7 of the petition, and in lines 4, 12, 14 and 15 page 1 of the specification, cancel the words "and apparatus."

Page 1, lines 22-23 cancel "protective" and insert "repellant".

Page 4, line 4, change "empiracally" to "empirically".

Page 4, cancel the matter beginning with "such", line 28, and ending with "vessel", line 30

In claims 1 and 2, line 2, after "of" insert "unsaturated" and after "or" insert "their".

Same claims, line 3, change "and" to "or".

It is thought that, as amended, claims 1 and 2 are not objectionable as alternative. There seems to be no better way of stating the scope of the invention clearly in the claim than by the use of the phrase "fatty acids or their glycerides"

Reconsideration is requested.

Respectfully,
George B. Parkinson

Cincinnati, Ohio,
April 30, 1909.

Div. 31 Room 169 — 2-260 — Paper No. ____

"The Commissioner of Patents, Washington, D. C." and not any official by name.

All communications concerning this application should give the serial number, date of filing, title of invention, and name of the applicant.

DEPARTMENT OF THE INTERIOR

934 UNITED STATES PATENT OFFICE

WASHINGTON, D.C., May 15, 1909.
MAILED " " "

Edwin C. Kayser,

C/o George B. Parkinson,

Commerical Tribune Bldg.,
Cincinnati, Ohio.

Please find below a communication from the EXAMINER in charge of the application of your

No. 422,366, Methods and Apparatus for Saturating Fatty Acids or their Glycerides with Hydrogen, filed March 20, 1908.

E. B. Moore
Commissioner of Patents.

This case has been reconsidered in view of the amendment of May 3, 1909.

It is thought that applicant intended to cancel claims 3 and 4 so as to make the claims uniform with the amended specification. These claims shouldbe cancelled in the next action.

Claims 1 and 2 are not deem to present any patentable novelty over the German patent to Herförder Maschinenfett et al., 141,029, Ausgegben May 4, 1903 (87-Refining Fat Oils) and are rejected thereon.

W.N.H. Ely
Examiner.

MAIL ROOM
MAY 15 1909
U.S.PATENT OFFICE.

Paper No. 4
MAY 15 1909
Division 6. B

U.S.Patent Office Serial No. 422366
RECEIVED
MAY 20 1909
Division 31, Paper No.

In re application of
Edwin C. Kayser, for
Method of Saturating Fatty Acids,
Filed March 20, 1908,
Serial No. 422,366.

Cincinnati, Ohio, May 13, 1909.

Hon. Commissioner of Patents,

Washington, D. C.

Sir:-

Response to Action of May 18, 1908.

This application is amended by cancelling claims 3 and 4.

Respectfully,

George B. Parkinson.

935

Div. 31 Room 159 2-260 Paper No. 5

"The Commissioner of Patents, Washington, D. C." and not any official by name.

All communications respecting this application should give the serial number, date of filing, title of invention, and name of the applicant.

DEPARTMENT OF THE INTERIOR

UNITED STATES PATENT OFFICE

WASHINGTON, D.C., May 27, 1909.

MAILED * * *

Edwin C. Kayser,

C/o George B. Parkinson,

Commercial Tribune Bldg.,

Cincinnati, Ohio.

Please find below a communication from the EXAMINER in charge of your *application of*

No. 422,366, Methods and Apparatus for Saturating Fatty Acids, or their Glycerides with Hydrogen, filed March 20, 1908.

E.B. Moore.

Commissioner of Patents.

This case has been reconsidered in view of the amendment of May 15, 1909.

An amendment dated in Cincinnati May 13, 1909, was received in the mail room of the Patent Office May 15th, and in Division 31, May 20th. This amendment cancelled claims 3 and 4. On May 15, a letter was mailed the applicant rejecting claims 1 and 2 on a cited reference. These claims stand under rejection of the date of the said letter and abandonment will run one year from May 15, 1909.

Ely

Examiner.

W.N.H.

936

MAIL ROOM
NOV 26. 1909
U.S.PATENT OFFICE

U.S.Patent Office No. 422366
RECEIVED
Sub. Power of Atty.
NOV 27 1909
Division 31, Paper No. 6.

In re application of

Edwin C. Kayser,

For Improvement in Methods and

Apparatus for Saturating Fatty Acids,

Filed March 20, 1908,

Serial No. 422,366.

Cincinnati, O. Nov. 23, 1909.

Hon. Commissioner of Patents;

Washington, D. C.

Sir:-

Please substitute Alfred M. Allen of Cincinnati, Ohio, for myself as attorney for applicant in the above entitled application.

Respectfully,

George B. Parkinson.

APPLICATION ROOM
FEB 18 1910
U.S.PATENT OFFICE.

U.S.Patent Office, Serial No.
RECEIVED
FEB 19/1910
Division 31, Paper No. 7

Cincinnati, Ohio, February 15th, 1910.

Commissioner of Patents,

Washington, D. C.

Dear Sir,-

I hereby appoint Messrs. Byrnes, Townsend and Brickenstein, a firm composed of E. A. Byrnes, C. P. Townsend and J. H. Brickenstein, all of Washington, D. C., my associate attorneys in the matter of the application of Edwin C. Kayser, for patent on Method and Apparatus for Saturating Acids or Their Glycerides with Hydrogen, Serial Number 422,366, filed March 20, 1908.

Yours truly,

Alfred M. Allen

Atty.

Room 169.
APPLICATION ROOM
MAY 13 1910
U.S.PATENT OFFICE.

U.S.Patent Office, Serial No.422,366
RECEIVED
May 14 1910 C
Division 31, Paper No.8

Edwin C. Kayser,

FiledMarch 20, 1908, Ser. No. 422,366,

"Methods and Apparatus for Saturating Fatty Acids, or their Glycerides with Hydrogen."

Washington, D. C., May 13, 1910.

Hon. Commissioner of Patents,

Sir:-

Replying to Office letter of May 15, 1909:

Amendment is made by adding the following claims:-

3. The process of reducing fatty acids and their esters, which consists in mechanically agitating a mixture of the fatty acid or ester and a pulverulent metallic catalyser in the presence of hydrogen.

4. The process of reducing fatty acids and their esters, in a closed vessel, which consists in subjecting the fatty acid or ester to the action of compressed hydrogen and a metallic catalyser.

5. The process of reducing fatty acids and their esters, which consists in mechanically agitating a mixture of the fatty acid or ester and a pulverulent metallic catalyser in the presence of compressed hydrogen.

REMARKS.

The German patent cited describes: (1) conducting they fatty acid vapor and hydrogen over a catalyser; and (2) adding the catalyser to the fatty acid, heated, and passing hydrogen through the acid. It does not describe the subject-matter of applicant's claims, to wit: the mechanical agitation of a mixture of the acid and pulverulent catalyser in the presence of hydrogen, specifically the projection af films or spray of the mixture into the hydrogen; or the use of compressed hydrogen. Reconsideration is requested.

Respectfully submitted,
Byrnes, Townsend & Brickenstein.
Attys.

Cls-3-5-

BERLIN MILLS CO. VS. PROCTER & GAMBLE CO.

938

Div. 31 Room 169

Address only "The Commissioner of Patents, Washington, D. C." and not any official by name.

2-200

MDE

Paper No. 9

All communications respecting this application should give the serial number, date of filing, title of invention, and name of the applicant.

DEPARTMENT OF THE INTERIOR

UNITED STATES PATENT OFFICE

WASHINGTON, D.C., May 28, 1910.

MAILED " " "

Edwin C. Kayser,

C/o Byrnes, Townsend & Brickenstein,

City.

Please find below a communication from the EXAMINER in charge of the application of your

No. 422,366, Methods of and Apparatus for Saturating Fatty Acids, or their Glycerides with Hydrogen, filed March 20, 1908.

E. D. Moore,

Commissioner of Patents.

6-961

This case has been reconsidered in view of the amendment of May 13, 1910.

Claim 4 is rejected on the German patent of record, attention being directed to lines 47 and 48 thereof.

Agitation is a usual step in chemical processes and to add this step to the process disclosed by the German patent is not seen tobe patentable distinction therefrom. Claims 3 to 3 and 5 are therefore rejected on the said patent.

Fly

23 Examiner.

APPLICATION ROOM
JAN 20 1911
U.S.PATENT OFFICE.
Room 169.

U.S.Patent Office Serial No. 422,366.
RECEIVED
JAN 21 1911 D
Division31, Paper No. 10

Edwin C. Kayser,

Filed March 20, 1908, Ser. No. 422,366,

"Methods of and Apparatus for Saturating Fatty Acids, or their Glycerides with Hydrogen."

Hon. Commissioner of Patents,

Sir:-

In view of Office letter of May 28, 1910, amendment is made as follows:

Claim 4, line 2, after "ester" insert ", in a closed vessel,"; line 3, after "of" insert "an atmosphere of".

REMARKS.

The German patent No. 141,029, cited in rejection of claim 4, has been considered, The paragraph cited, including lines 47-8, is as follows:

"Gibt man z. B. feines Nickel pulver, durch Reduktion im Wasserstoffstrom erhalten, zu chemisch reiner Ölsaure, erwarmt im Olbad und leitet einen kräftigen Strom von Wasserstoffgas längere Zeit hindurch, so wird die Ölsäure bei genügend langer Einwirkung vollständig in Stearinsaure übergeführt."

While this patent describes forcing a strong current of hydrogen through oleic acid, any pressure employed to drive the hydrogen through the liquid is incidental and immaterial. In applicant's process, the fatty acid or ester is subjected in a closed vessel to the simultaneous action of the metallic catalyzer and an atmosphere of compresses hydrogen, the speed of reaction being thereby greatly increased. Claim 4 has been amended to more distinctly include the limiting conditions.

Claims 1, 2, 3 and 5 are limited to the step of throwing films or a spray of a mixture of the liquid and pulverulent catalyzer into an atmosphere of hydrogen, specifically under pressure, or otherwise mechanically agitating the mixture

to keep the catalyzer in suspension and movement. This mode of operationappears to be entirely new in the art and is of the greatest practical importance. In prior methods, including that of the German patent cited, the catalyzer is a body of massed particles, lying in the bottom of the treating vessel, or carried by a grid or other fixed support. The particles lie in close contact, much of the catalytic metal being inactive. By applicant's method of mechanically maintaining the catalyzer in suspension and active movement through the liquid, every particle thereof is brought into intimate and shifting contact with the liquid, the rubbing together and friction of themetalized particles and liquid increasing the action, and the attrition of the particles on each other keeping the metalized surfaces in active condition. It is submitted that the claims, limited to this novel and highly important mode of procedure, should be allowed, It was understood at an interview with the Examiner that the reference would not be insisted on.

Reconsideration is requested.

Respectfully,

EDWIN C. KAYSER,

By Byrnes, Townsend & Brickenstein,
Attys.

941

Div. 31 Docu. 169 2-260 Paper No. 11

The Commissioner of Patents, Washington, D. C., are not authorized by name. All communications respecting this application should give the serial number, date of filing, title of invention, and name of the applicant.

DEPARTMENT OF THE INTERIOR

UNITED STATES PATENT OFFICE

WASHINGTON Feb. 14, 1911.

MAILED " " "

Edwin Cuno Jayser,

Care, Byrnes, Townsend & Brickenstein,

Washington, D. C.

Please find below a communication from the EXAMINER in charge of the application of your

No. 422,366, Methods and App. for Saturating Fatty Acids, or their Glycerides with Hydrogen, filed Mar. 20, 1908.

E. B. Moore.

Commissioner of Patents.

This case has been reconsidered in connection with the amendment of Jan. 20, 1911.

The German patent 141,029, of record, in lines 39-42, discloses that vapors of fatty acids together with hydrogen are conducted over catalytic metal. The fumes or spray claimed by applicant in claims 1 and 2 are thought to find their equivalent in these vapors of the German patent. It is thought that claim 4 is substantially met in the above referred to lines of the patent. Respecting the meaning of lines 47-48 of the patent, it is not understood that a strong stream of hydrogen can be conducted through the liquid with merely incidental pressure. It is thought that a pressure would be essential to the passage of the gas through the material and that the incorporation in claims 3 and 5 of the familiar idea of mechanical agitation is not thought to add patentability to these claims over the reference.

The claims are all rejected.

W.W.H.

Ely
Examiner.

APPLICATION ROOM
MAR 3 1911
U.S.PATENT OFFICE

U.S.Patent Office, Serial No. 422,366
RECEIVED
MAR 4 1911
Division XI, Paper No. 12

Room 169.
Edwin Cyro Kayser,

Filed March 20, 1908, Ser. No. 422,366,

"Methods and App. for Saturating Fatty Acids, or their Glycerides with Hydrogen."

Washington, D. C., March 2, 1911.

Hon. Commissioner of Patents,

Sir:-

In view of Office letter of February 14, 1911, and pursuant to an interview with the Examiner, amendment is made as follows:

Cancel the claims and substitute:

1. The process of hydrogenizing fatty acids and their esters, which consists in bringing films or spray of a mixture of the acid or ester and a pulverulent catalyzer into intimate contact with an atmosphere containing hydrogen.

E'

2. The process of hydrogenizing fatty acids and their esters, which consists in bringing films or spray of a mixture of the acid or ester and a pulverulent catalyzer into intimate contact with a compressed atmosphere containing hydrogen.

3. The process of hydrogenizing fatty acids and their esters, which consists in mechanically agitating a mixture of the fatty acid or ester and a pulverulent metallic catalyzer in the presence of hydrogen, whereby the acid or ester and hydrogen are brought into intimate contact with active surfaces of said catalyzer.

4. The process of hydrogenizing fatty acids and their esters, which consists in subjecting the fatty acid or ester, in a closed vessel, to the action of an atmosphere of compressed hydrogen and a metallic catalyzer, and repeatedly bringing different portions of the acid or ester into contact with said atmosphere to increase its surface contact with the hydrogen.

per F

per F

1 Cls.

5. The process of hydrogenizing fatty acids and their esters, which consists in mechanically agitating a mixture of the fatty acid or ester and a pulverulent metallix catalyzer in the presence of compressed hydrogen, whereby the acid or ester and hydrogen are brought into intimate contact with active surfaces of said catalyzer.

REMARKS.

The German patent 141,029, cited, discloses no operative method of conducting the fatty acid vapor, together with hydrogen, over catalytic metal. Oleic acid cannot be vaporized by heating it under normal conditions, since it decomposes below its boiling point. Vid:

Beilstein, V. 1. p. 525.

"Celsaeure,--Zerfellt bei der Destillation in Sebacin,- Eddig-, Caprvl-und Caprin-saeure, CO_2, H_2O und Kolenwasserstoff."

Berthser, p. 180. "Oleic acid.--Cannot be volatized without decomposition."

Furthermore, applicant is not claiming the treatment of "fumes" but of films or spray". Aside from this, claims 1 and 2 are specifically limited to films or spray containing both the fatty acid or ester and the pulverulent catalyzer, a mode of operation not disclosed or suggested in the patent. Claims 1 and 2 have been re-written, in accordance with the informal suggestion of the Examiner, to definitely specify films or spray of the acid or ester and a pulverulent catalyzer.

As to claim 4, the statement in the German patent that a strong current of hydrogen is passed through the oleic acid does not disclose the use of an atmosphere of compressed hydrogen over the liquid. Even if it be assumed that a closed vessel is used, to permit recovery of the unutilized hydrogen, as suggested by the Examiner, this does not require or imply

compressionof the hydrogen over the oil. In view of the further objection made at the interview, however, that the mere contact of a quiescent body of the acid or ester and compressed hydrogen would not be operative, this claim has been limited to agitation of the acid orester to increase its surface contact with the hydrogen.

A statement as to the utility of agitating the mixture of the acid or ester and catalyzer has been appended to claims 3 and 5, as requested by the Examiner.

It was understood at the interview that the claims as amended are allowable. Reconsideration is requested.

Respectfully,

EDWIN CUNO KAYSER,

By Byrnes, Townsend & Brickenstein

Attys.

APPLICATION ROOM
MAR 11 1911
U.S.PATENT OFFICE.

U.S.Patent Office Serial No. 422,366
RECEIVED
MAR 13 1911
Division 31, Paper No. 13

Room 169.
Edwin Cuno Kayser,

Filed March 20, 1908, Ser. No. 422,366.

"Methods and App. for Saturating Fatty Acids, or their Glycerides with Hydrogen."

Washington, D. C., March 11, 1911.

Hon. Commissioner of Patents,

Sir:-

Further amendment is made as follows:

Claim 4, lines 4-6, cancel "the" *** hydrogen," and substitute: "different portions of the acid or ester into contact with said atmosphere."

Respectfully submitted,

EDWIN CUNO KAYSER,

By Byrnes Townsend & Brickstein

Attys.

ADDRESS ONLY THE COMMISSIONER OF PATENTS, WASHINGTON, D. C.

2—181 Serial No. 422,366.

K.C

DEPARTMENT OF THE INTERIOR

UNITED STATES PATENT OFFICE

WASHINGTON March 21, 1911.

Edwin Cuno Kayser, Assor.
%Byrnes, Townsend & Brickenstein,
Washington, D. C.

Sir: Your APPLICATION for a patent for an IMPROVEMENT in Methods for Saturating Fatty Acids or their Glycerides with Hydrogen,

filed March 20, 1908 has been examined and ALLOWED.

The final fee, TWENTY DOLLARS, must be paid not later than SIX MONTHS from the date of this present notice of allowance. If the final fee be not paid within that period, the patent on this application will be withheld, unless renewed with an additional fee of $15, under the provisions of Section 4897, Revised Statutes.

The office delivers patents upon the day of their date, and on which their term begins to run. The printing, photolithographing, and engrossing of the several patent parts, preparatory to final signing and sealing, will require about four weeks, and such work will not be undertaken until after payment of the necessary fee.

When you send the final fee you will also send, DISTINCTLY AND PLAINLY WRITTEN, the name of the INVENTOR and TITLE OF INVENTION AS ABOVE GIVEN, DATE OF ALLOWANCE (which is the date of this circular), DATE OF FILING, and, if assigned, the NAMES OF THE ASSIGNEES.

If you desire to have the patent issue to ASSIGNEES, an assignment containing a REQUEST to that effect, together with the FEE for recording the same, must be filed in this office on or before the date of payment of final fee.

After issue of the patent uncertified copies of the drawings and specifications may be purchased at the price of FIVE CENTS EACH. The money should accompany the order. Postage stamps will not be received.

Final fees will NOT be received from other than the applicant, his assignee or attorney, or a party in interest as shown by the records of the Patent Office.

Respectfully,

31 E. B. Moore.

Commissioner of Patents.

IN REMITTING THE FINAL FEE GIVE THE SERIAL NUMBER AT THE HEAD OF THIS NOTICE.

UNCERTIFIED CHECKS WILL NOT BE ACCEPTED.

$20 RECEIVED
AUG 28 1911
CHIEF CLERK U.S.PATENT OFFICE

2—327.

MEMORANDUM

OF

FEE PAID AT UNITED STATES PATENT OFFICE.

(Be careful to give correct Serial No.)

Serial No. 422,368, *191*

INVENTOR:

Edwin C. Kayser

PATENT TO BE ISSUED TO

NAME OF INVENTION, AS ALLOWED:

Methods and Apparatus for Saturating Fatty Acids

DATE OF PAYMENT:

Aug. 28, 1911

FEE:

Final Gov't fee, $20.00

DATE OF FILING:

March 20, 1908

DATE OF CIRCULAR OF ALLOWANCE:

March 21, 1911

The Commissioner of Patents will please apply the accompanying fee as indicated above.

Alfred M. Allen
Attorney.

SEND PATENT TO

Alfred M. Allen,
303 Bell Block,
Cincinnati,
Ohio.

"ADDRESS ONLY THE COMMISSIONER OF PATENTS, WASHINGTON, D. C." 2-191. SERIAL NO. TRM 422,366

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
WASHINGTON

August 29, 1911.

Edwin C.Kayser,Assor,, PATENT
SEP 26 1911
c/o Alfred W. Allen, WILL ISSUE

Cincinnati, Ohio.

Sir:

You are informed that the final fee of TWENTY DOLLARS has been received in your application for Improvement in Methods for Saturating Fatty Acids or Their Glycerides with Hydrogen.

Date of receipt Aug. 28, 1911.

Very respectfully

JJ E. B. Moore
Commissioner of Patents.

Bf
Drg

948

1908

OILS, FATS, AND GLUE.
Refining oils.

C O N T E N T S:

Print

Apolication papers.

1. Rej. May 18, 1908.
2. Amendt A. May 3, 1909
3. Rej May 15, 1909
4. Amendt B May 15, 1909
5. Letter May 27, 1909
6. Sub, Power of Att'y Mar. 26, 1909
7. Asso. " " " Feb. 18, 1910
8. Amendt. C. May 13, 1910.
9. Rej. May 28, 1910
10. Amendt D- July 20, 1911
11. Rej. Feb 14 1911
12. Amendt. E-. Mch. 3, 1911
13. " F " 11, "

TITLE:

Improvement in Methods forSaturating Fatty Acids or their Glycerides with Hydrogen. (5 Claims)

4 & 5 Claims

Here follow diagram marked p. 949

950

Berlin Mills
Pr Gleo Sp. 949

E. C. KAYSER.

METHOD FOR SATURATING FATTY ACIDS OR THEIR GLYCERIDS WITH HYDROGEN.

APPLICATION FILED MAR. 20, 1908.

1,004,035. Patented Sept. 26, 1911.

2 SHEETS—SHEET 1.

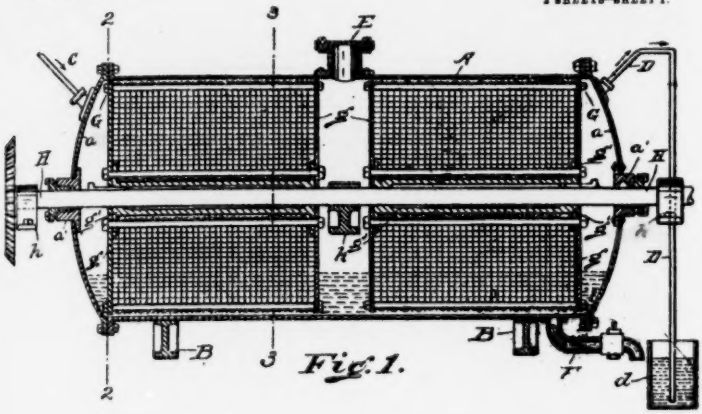

Fig. 1.

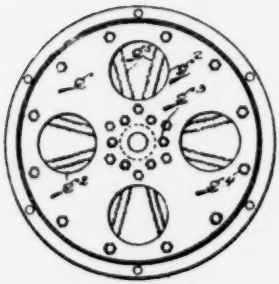

Fig. 2.

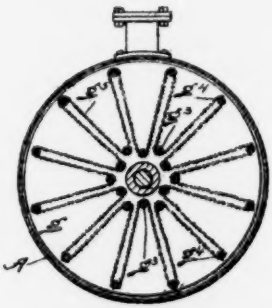

Fig. 3.

Witnesses
Agnes Blount
M. Howard

Inventor
Edwin Conn Kayser,
By Henry D. Williamson,
Attorney

Berlin Mill Pr & Co

BERLIN MILLS CO. VS. PROCTER & GAMBLE CO.

P 950 / P 950

E. C. KAYSER.

METHOD FOR SATURATING FATTY ACIDS OR THEIR GLYCERIDS WITH HYDROGEN.

APPLICATION FILED MAR. 20, 1908.

1,004,035.

Patented Sept. 26, 1911.

2 SHEETS—SHEET 2.

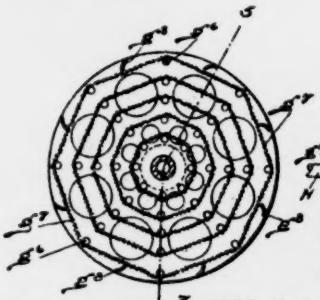

Fig. 4.

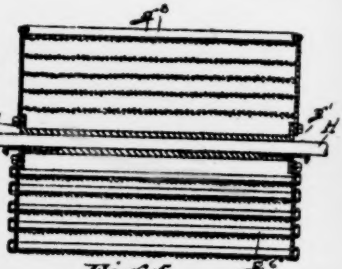

Fig. 5.

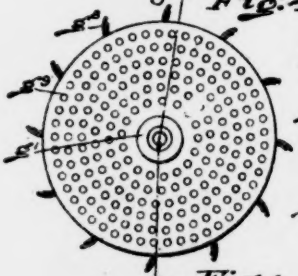

Fig. 6.

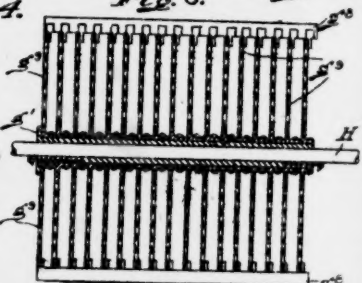

Fig. 7.

Fig. 8

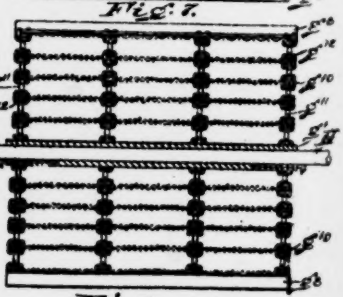

Fig. 9

Witnesses

Agnes B. Grant.

Inventor

Edwin Chas. Kayser,

By Geo. B. Gardiner.

Attorney

951

UNITED STATES PATENT OFFICE.

EDWIN CUNO KAYSER, OF CINCINNATI, OHIO, ASSIGNOR TO THE PROCTER & GAMBLE COMPANY, OF CINCINNATI, OHIO, A CORPORATION OF OHIO.

METHOD FOR SATURATING FATTY ACIDS OR THEIR GLYCERIDS WITH HYDROGEN.

1,004,033. Specification of Letters Patent. Patented Sept. 26, 1911.

Application filed March 20, 1908. Serial No. 422,366.

To all whom it may concern:

Be it known that I, EDWIN CUNO KAYSER, a citizen of Great Britain, now residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Methods for Saturating Fatty Acids or their Glycerids with Hydrogen, of which the following is a specification.

Though it is known in a general way that unsaturated fatty acids or their glycerids may be converted into the corresponding saturated compounds by treatment with gaseous hydrogen in presence of certain finely divided metals, acting as catalyzers, the process cannot be commercially exploited without special methods.

The object of my invention is to provide such methods, and my invention consists in the methods hereinafter described and claimed.

The principal physical and mechanical considerations affecting the practical working of this process, are:—to bring about and maintain, until the desired transformation be achieved, extensive contact between a mixture of metal and oil and the hydrogen gas, and moreover to produce such friction and impingement, as will enable the gas to penetrate to the recipient metal in spite of the repellent coating of oil. These conditions are attained by propelling in form of films or spray a comparatively small, but ever changing part of the hot oil-mixture, within an atmosphere of hydrogen. While this general principle should be embodied in all apparatus employed to the present purpose, there is considerable latitude in constructive detail.

The preferred form of apparatus consists essentially of a closed horizontal cylindrical vessel, adapted to receive the hydrogen gas and to contain a comparatively small column of the mixture of oil and catalytic metal, in which cylinder is rotatably mounted a paddle wheel, or a plurality of such wheels, having blades of wire gauze or equivalent material.

In the drawings, Figure 1 is a vertical longitudinal section of one form of apparatus embodying my invention; Fig. 2 a section on the line 2—2 of Fig. 1; Fig. 3 a section on the line 3—3 of Fig. 1; Fig. 4, a vertical cross section of a modified form of paddle wheel; Fig. 5, a longitudinal section on the line 5—5 of Fig. 4; Fig. 6 an end view of another modified form of paddle wheel; Fig. 7 a longitudinal section on the line 7—7 of Fig. 6; Fig. 8 an end view of another modified form of the paddle wheel; and Fig. 9 a vertical cross section on the line 9—9 of Fig. 8.

The reference character, A, represents the cylinder, which is mounted upon suitable supports, B, and preferably has dished ends, *a*.

C represents the inlet pipe and D the outlet pipe for the gas, the outlet pipe being sealed at *d* by a column of oil.

E is the charge hole for the oil and metal, and F the discharge tap.

G and G are paddle wheels fixed to a shaft H, mounted in bearings *h* and entering the cylinder through stuffing boxes *a'*. The paddle wheels are formed of end-plates g, fixed to a sleeve g' keyed to the shaft, and provided with openings g^2 for admission of gas, and with an inner and outer series of bolt holes for the reception of rods g^3 and g^4 extending longitudinally of the wheel. The inner series of rods is preferably staggered to permit use of a greater number in a limited area, thereby reducing the lost space. These rods serve as supports for an endless band g^5 of wire gauze, which leads alternately over an inner and an outer rod, as clearly shown in Fig. 3.

In Figs. 4 and 5 I have shown a modified form of the paddle wheel, in which a concentric series of wire gauze polygons are substituted for the wire gauze paddle blades. In this form the paddle wheels are provided with a number of concentric series of longitudinal rods g^6 and with endless bands g^7 of wire gauze. Polygons may be somewhat deficient in agitating action; and I therefore provide a series of peripheral longitudinal scoops g^8 carried by the end plates.

In Figs. 6 and 7 I have shown another form of the paddle wheel, in which a series of perforated disks g^9 mounted upon the shaft, and connected at their outer peripheries by a series of longitudinal scoops g^8, take the place of the paddle blades shown in Figs. 1 to 3.

In Figs. 8 and 9 I have shown another form of paddle wheel, in which a series of concentric gauze cylinders, g^{10}, is mounted about the shaft and supported at regular distances by concentric perforate spacing rings,

g^{11}, connected by bolts g^{12}. The outer rings carry longitudinal agitating scoops g^{9}.

In operation, the bottom of the containing cylinder is supplied with a limited quantity of the mixture of fatty matter and catalytic agent, destined to be engaged by the peripheries of the paddles, which latter, in their rotation, carry a series of films of such mixture through the hydrogen, and in intimate and sustained contact therewith. The paddle wheels are revolved at a speed appropriate to the diameter of the machine, to the number of paddles, and to their particular construction. The best speed must be ascertained empirically. When the hydrogen is supplied under pressure, a lower speed, than would otherwise be required, will answer the purpose.

When working under ordinary pressure, the supply of hydrogen need only be such as to prevent formation of a vacuum within the machine, but a slight excess is generally allowed to pass through and escape from the apparatus, so that steam and gaseous by-products, incidentally generated, may be carried away. When, instead of pure hydrogen, a gas mixture is employed, such as "water-gas," the current must be sufficiently strong to prevent undue accumulation of the indifferent constituents of such gas mixture, notably carbon monoxid, which might otherwise retard or entirely arrest the process.

When pure hydrogen is used under artificial pressure, the gas outlet should be closed by a weighted valve, and the gas supply so regulated as to constantly maintain the desired pressure; but, if "water-gas," or the like, is to be used under pressure, it will be necessary to periodically relieve the pressure by blowing off the inert gas accumulated within the apparatus.

The temperature of the oil and metal mixture may vary within considerable limits, a temperature from 150 to 160° C. will, as a rule, be found suitable.

The time of treatment will vary with the progress realized and with the degree of saturation aimed at.

I claim as my invention:

1. The process of hydrogenizing fatty acids and their esters, which consists in bringing films or spray of a mixture of the acid or ester and a pulverulent catalyzer into intimate contact with an atmosphere containing hydrogen.

2. The process of hydrogenizing fatty acids and their esters, which consists in bringing films or spray of a mixture of the acid or ester and a pulverulent catalyzer into intimate contact with a compressed atmosphere containing hydrogen.

3. The process of hydrogenizing fatty acids and their esters, which consists in mechanically agitating a mixture of the fatty acid or ester and a pulverulent metallic catalyzer in the presence of hydrogen, whereby the acid or ester and hydrogen are brought into intimate contact with active surfaces of said catalyzer.

4. The process of hydrogenizing fatty acids and their esters, which consists in subjecting the fatty acid or ester, in a closed vessel, to the action of an atmosphere of compressed hydrogen and a metallic catalyzer, and repeatedly bringing different portions of the acid or ester into contact with said atmosphere.

5. The process of hydrogenizing fatty acids and their esters, which consists in mechanically agitating a mixture of the fatty acid or ester and a pulverulent metallic catalyzer in the presence of compressed hydrogen, whereby the acid or ester and hydrogen are brought into intimate contact with active surfaces of said catalyzer.

EDWIN CUNO KAYSER.

Witnesses:
W. W. SYMMES,
AGNES B. GRANT.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

DEFENDANT'S EXHIBIT H 953

UNITED STATES OF AMERICA,

DEPARTMENT OF THE INTERIOR,

UNITED STATES PATENT OFFICE.

To all to whom these presents shall come, Greeting:

THIS IS TO CERTIFY that the annexed is a true copy from the Records of this Office of the File Wrapper and Contents, in the matter of the

Def't Ex. No. H
U. S. Dist Court,
S. D. of N. Y.
MAR 22 1917

Letters Patent of

Edwin Cuno Kayser, Assignor to

The Proctor and Gamble Company,

Number 1,008,474, Granted November 14, 1911,

for

Improvement in Method of Saturating Fatty Acids or their Glycerids with Hydrogen.

IN TESTIMONY WHEREOF I have hereunto set my hand and caused the seal of the Patent Office to be affixed at the City of Washington, this 3rd day of February, in the year of our Lord one thousand nine hundred and sixteen and of the Independence of the United States of America the one hundred and fortieth.

J. T. Newton

Acting Commissioner of Patents.

10

43—344

954

DIV # 31

B—437

NUMBER (SERIES OF 1900).
544630

1910

(EX'R'S BOOK).

PATENT No. 1008474

Name Edwin Cuno Kayser,
Assor to The Procter and Gamble Company,
of Cincinnati, Ohio,
a corp. of Ohio.

of Cincinnati

County of

State of Ohio

Invention Methods of Saturating Fatty Acids or Their Glycerides with Hydrogen

Division of App., No. filed . 191 .

PARTS OF APPLICATION FILED.

	ORIGINAL.	RENEWED.
Petition	February 18 , 1910	, 19
Affidavit	" " , 1910	, 19
Specification	" " , 1910	, 19
Drawing	Sept. 11. 1911 , 191	, 19
Model or Specimen	, 191	, 19
First Fee Cash $15.	Feb 18 , 1910	, 19
" " Cert.	, 191	, 19
Appl. filed complete	Feb 18 , 1910	, 19
Examined	C. S. Ely Ex'r Sept 28, 1911	, 19
Allowed	W. W. Vortiner For Commissioner.	For Commissioner.
Notice of Allowance	Oct. 5 , 1911	, 19
Final Fee Cash $20	Oct 18 , 1911	, 19
" " Cert.	, 191	, 19
Patented	November 14	, 19

Associate Attorneys Byron Townsend & Brickenstein City Attorney Alfred M. Allen, Cincinnati, Ohio
#304 Bell Block.

Certificate Corrected Jan'y 16 1912

No. of Claims Allowed 3) Title as Allowed Method of Saturating Fatty Acids or Their Glycerides with Hydrogen

544630 Div. 31.

955544630

15 cts

RECEIVED
FEB 18
1910
CHIEF CLERK, U.S.PATENT OFFICE.

Paper No. 1

FEB 21'1910
Division 6.

TO THE COMMISSIONER OF PATENTS:--

Your petitioner, Edwin Cuno Kayser, a subject of the King of Great Britain, and a resident of the city of Cincinnati, in the county of Hamilton and state of Ohio, United states of America, whose Post Office address is #3553 Bogart Avenue, Cincinnati, Ohio, prays that Letters Patent may be granted to him for the improvements in Methods for Saturating Fatty Acids or Their Glycerides with Hydrogen, set forth in the annexed specification; and he hereby appoints Alfred M. Allen, of Cincinnati, Ohio, his attorney, with full power of substitution and revocation, to prosecute this application, to make alterations and amendments therein, to receive the patent, and to transact all business in the Patent Office connected therewith.

Signed at Cincinnati, in the county of Hamilton and state of Ohio, this 18th day of February, 1910.

Edwin Cuno Kayser

TO ALL WHOM IT MAY-CONCERN:--

Be it known that I, Edwin Cuno Kayser, a subject of the King of Great Britain, and a resident of the city of Cincinnati, in the county of Hamilton and state of Ohio, United States of America, have invented certain new and useful improvements in the Methods for Saturating Fatty Acids or Their Glycerides with Hydrogen, of which the following is a specification.

It is by now well known that unsaturated fatty acids their glycerides or other esters, in the fluid state, can be made to absorb gaseous hydrogen, until they become converted into the corresponding semi-saturated or saturated compounds, by the intervention of certain finely divided metals, nickel in particular.

For that purpose, the nickel-powder is kept in suspension in the hot oil or fatty acid, whilst hydrogen gas is passed through, or otherwise brought in suitable contact with the mixture.

In order to sufficiently expedite the transfer of hydrogen for practical purposes, considerable quantities of nickel have to be present.

This metal must take the form of an almost impalpable powder and in consequence, when it comes to its separation from the product of reaction, it will be found to form an almost impenetrable sediment on the filter cloth, a fact greatly interfering with the technical applicability of the process.

Moreover, for reasons but imperfectly understood, but apparently due to the deposition thereon of carbonaceous

by-products, such pure metal soon loses its catalytic activity and cannot be made to repeatedly answer its purpose.

In the catalytic production of sulphuric acid, and in similar industrial processes, where reaction between gases is to be induced, it is customary to spread the catalytic metal or other catalyser over fibrous materials like asbestos, over fragments of brick or the like inert materials. Since the "catalyst" in these cases remains stationary, such measures are obviously necessary in order to facilitate the transverse movement of the gas through the catalyser, or in order to produce more contact than a mere passage over a pulverous layer of metal would afford.

In the present instance, however, when the metallic particles are already kept apart and readily accessible by their suspension in a liquid medium, it would be considered unnecessary to disseminate such metal over an inert vehicle and the presence of the latter would be judged more likely to impede than to facilitate the reaction.

I have, notwithstanding this, ascertained, however, that nickel firmly and evenly deposited upon a voluminous, pulverous inert material exercises in a fluid medium a far more energetic action, and much longer retains its vitality than an equal weight of pure metal in the finest state of division procurable.

The method of thus depositing on or coating the pulverous inert material with the nickel powder forms no part of my present invention, which relates to the use of such pulverous nickelized material in the saturation of oils and fats with hydrogen.

It will, therefore, be sufficient to state that in order to prepare my catalytic agent, I bring suitable soluble or insoluble compounds of nickel in an appropriate manner into intimate combination with an inert absorptive and comparatively bulky mineral substance such as Kieselguhr. I then dry and comminute the product, and reducing the powder thus produced with hydrogen, a highly efficient and reliable nickelized, inert pulverous material is the result.

In order to carry out my process, I introduce into a suitable closed receptacle a quantity of the mixture of my fatty material and the pulverized, nickelized inert support, and by means of paddles or stirrers, I thoroughly agitate the mixture while introducing the hydrogen.

The vessel may either be filled with the charge, in which case the gas has to be atomized within the fluid, or the vessel may be only partly filled, so as to permit the agitators or paddles to propel or project the charge into a surrounding atmosphere of hydrogen.

By preference, the hydrogen is supplied under pressure but a certain amount is always allowed to continuously escape in order to carry off generated steam and other gaseous by-products.

Under suitable precautions, water gas or other gas mixture sufficiently rich in hydrogen gas may be used in place of pure hydrogen.

When pure hydrogen is used, under artificial pressure, the gas outlet should be closed by a weighted valve, and the gas supply so regulated as to constantly maintain the desired pressure.

The temperature of the oil mixture may vary within considerable limits. A temperature from one hundred and fifty degrees Centigrade to one hundred and sixty degrees Centigrade will, as a rule, be found desirable.

The great technical advantage secured by my process in which the nickel powder is firmly and evenly distributed upon the voluminous, pulverous inert material, when mixed with the oil or fat to be ~~fxxxdxdexirxbbpx~~ treated, may in part be attributed to the ultra-division of the metal, attainable by suitable chemical incorporation, with the inert vehicle, wherein it approaches the colloidal state. It may, however, with equal force be ascribed to a direct co-operation between metal and "inert" body, the latter, present in preponderating quantity and volume, absorbing the hydrogen in the first instance and then yielding it to the metal, which in turn transmits it to the fatty body.

The prolonged vitality of the catalyser may on the other hand be due either to a modified action of the disseminated metal and to a diminished formation of by-products, or to the retention thereof by the inert vehicle, or finally to the more constant physical structure of the metallic particles.

Whatever be the cause of the increased activity and prolonged vitality of the metalliferous pulverous catalyser over the pure metal, the direct technical advantage attained by the

change is sufficiently conspicuous.

This advantage is further advanced by two other factors, greatly pronounced when using a vehicle like Kieselguhr, namely the comparatively low specific gravity and the easy permeability of the catalyzer. The former greatly facilitates suspension in the surrounding fluid, the latter renders rapid and neat separation from the fatty substance by the conventional use of the filter-press an easy matter.

Finally, the inert material, which forms by far the principal constituent of a well-made catalyzer, exercises a decolorizing and deodorizing action upon the material treated far beyond that observed with an equal proportion of pure nickel.

What I claim as new, and of my invention and desire to secure by Letters Patent, is:--

1. The process of treating fatty acids or their glycerides or other esters which consists in introducing into the product to be treated a catalytic agent consisting of a finely divided inert support impregnated with metallic nickel and subjecting the mixture to the action of hydrogen.

2. The process of treating fatty acids or their glycerides or other esters which consists in introducing into the product to be treated a catalytic agent consisting of a finely divided inert support impregnated with metallic nickel and subjecting the mixture to the action of hydrogen, and at the same time agitating the mixture.

3. The process of treating fatty acids or their glycerides or other esters which consists in introducing into the product to

treated a catalytic agent consisting of a finely divided inert support impregnated with metallic nickel and subjecting the mixture within a closed vessel to the action of hydrogen, and at the same time subdividing and agitating the mixture.

4. The process of treating fatty acids or their glycerides or other esters which consists in introducing into the material to be treated a catalytic agent consisting of a finely divided inert support impregnated with metallic nickel, placing the mixture into a closed vessel, providing an atmosphere of compressed hydrogen gas in said vessel above the mixture, and repeatedly projecting or propelling portions of the mixture into said atmosphere.

Attest:

Arthur H. Ewald,

Earl W. Griffin.

Edwin Cuno Kayser

STATE OF OHIO.)
) SS:
COUNTY OF HAMILTON.)

Edwin Cuno Kayser,

the above named petitioner, being sworn, deposes and says that he is a subject of the King of Great Britain, and a resident of the city of Cincinnati, in the county of Hamilton and state of Ohio, United States of America, that he verily believes himself to be the original, first and sole inventor of the improvements in Methods for Saturating Fatty Acids or Their Glycerides with Hydrogen described and claimed in the annexed specification; that he does not know and does not believe that the same were ever known or used before his invention or discovery thereof, or patented or described in any printed publication in any country before his invention or discovery thereof, or more than two years prior to this application, or in public use or on sale in the United States for more than two years prior to this application; that said invention has not been patented in any country foreign to the United States on an application filed by him or his legal representatives or assigns more than twelve months prior to this application; and that no application for patent on said improvements has been filed by him or his representatives or assigns in any country foreign to the United States.

Edwin Cuno Kayser.

Sworn to and subscribed before me, this 16th day of February, 1910.

Arthur H. Ewald
Notary Public in and for
Hamilton County, Ohio.

SEAL

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APPLICATION ROOM
MAR
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1910
U.S.PATENT OFFICE.

U.S.Patent Office, Serial No. 544,630
RECEIVED
MAR 1 1910
Division 31, Paper No. 2

Cincinnati, Ohio, February 25, 1910.

Commissioner of Patents,

Washington, D. C.

Dear Sir,-

I hereby appoint the firm of Byrnes, Townsend and Brickenstein (composed of Eugene A. Byrnes, Clinton P. Townsend and John H. Brickenstein), of Washington, D. C., my associate attorneys in the matter of the application of Edwin C. Kayser, for patent for Methods of Saturating Fatty Acids or Their Glycerides with Hydrogen, filed February 18, 1910, bearing the Serial Number 544,630.

Yours truly,

By Alfred W Allen

Attorney for Edwin C. Kayser.

660
964

BERLIN MILLS CO. VS. PROCTER & GAMBLE CO.

Div. 32 Room 169 — 2-260 — Paper No. 3

Address only "The Commissioner of Patents, Washington, D. C." and not any official by name.

All communications relating to application should give the serial number, date of filing, title of invention, and name of the applicant.

DEPARTMENT OF THE INTERIOR MDE

UNITED STATES PATENT OFFICE

WASHINGTON, D.C., March 15, 1910.

MAILED * * *

Edwin C. Kayser,

C/o Byrnes, Townsend & Brickenstein,

City.

Please find below a communication from the EXAMINER in charge of the application of

your application, No. 544,630, Methods of Saturating Fatty Acids or Their Glycerides with Hydrogen, filed February 18, 1910.

E. B. Moore,

Commissioner of Patents.

Drawings showing apparatus capable of carrying out the process described on page 3, and claimed in claim 4 should be filed with appropriate description thereof.

Claims 1 to 3 are rejected on the German patent to Herforder Maschinenfett et al., 141,029, Ausgegeben May 4, 1903 (87-13, Transformation) or on the British patent to Bedford, 2520 of 1907 (25-Carbon Compounds)

However all the claims are rejected on the German to Erdm 211,669, Ausgegeben July 13, 1909 (87-13, Transformation).

W. M. H.

Ely

Examiner.

APPLICATION ROOM
MAR
15
1911
U.S.PATENT OFFICE.

U.S.Patent Office, Serial No. 544630
RECEIVED
MAR 16 1911
Division 31, Paper No. 4 a

Room 169.

Edwin C. Kayser,

Filed February 18, 1910, Ser. No. 544,630,

"Methods of Saturating Fatty Acids or their Glycerides with Hydrogen".

Washington, D. C., March 11,1911

Hon. Commission of Patents,

Sir:-

In view of Office letter of March 15, 1910, and following an interview with the Examiner in companion case Ser. No. 422,366, amendment is made as follows:

Cancel the claims and substitute:

1. The process of hydrogenizing fatty acids and their esters, which consists in agitating in the presence of hydrogen a heated mixture of the fatty acid or ester and a pulverulent catalyzer consisting of a light, voluminous, finely-divided, inert support impregnated with an active metal, whereby the catalyzer is maintained in suspension and the acid or ester and hydrogen are brought into intimate contact with the active surfaces of said catalyzer.

2. The process of hydrogenizing fatty acids and their esters, which consists in mechanically subdividing and agitating, in the presence of an atmosphere of hydrogen, a heated mixture of the fatty acid or ester and a pulverulent catalyzer consisting of a light, voluminous, finely-divided, inert support impregnated with metallic nickel, whereby the catalyzer is maintained in suspension and the acid or ester and hydrogen are brought into intimate contact with the active surfaces of said catalyzer.

3. The process of hydrogenizing fatty acids and their esters, which consists in repeatedly projecting or propelling into an atmosphere of compressed hydrogen portions of a heated mixture

Cls.

of the fatty acid or ester and a pulverulent catalyzer consisting of a light, voluminous, finely-divided, inert support impregnated with an active metal.

REMARKS.

A drawing will be furnished.

The references cited do not disclose the process of the present claims, each of which is limited to the agitation, in the presence of hydrogen, of a mixture of the fatty acid or ester and a pulverulent catalyzer, consisting of nickel carried by a light, voluminous, finely-divided, inert substance, such as kieselguhr. The German patent 141C39 describes two specific modes of procedure: (1) conducting the fatty acid vapor with hydrogen over the contact mass; and (2) conducting a current of hydrogen through oleic acid containing the contact mass. The Bedford patent describes the percolation of oleic acid downward through a permeable catalytic mass, coke or porous brick, or grids, plates or tubes impregnated with nickel, against a current of hydrogen forced in from below. The German patent 311,669 describes three modes of procedure: (1) percolating oleic acid downward through nickelized pumice-stone, clay balls, pottery or asbestos, against a rising current of hydrogen; (2) spraying oleic acid and hydrogen against a slowly-revolving cylinder of clay impregnated with nickel and heated to 160°; and (3) percolating oleic acid downward through nickelized pottery fragments against rising hydrogen, at a temperature of from 170° to 180°. It is obvious that neither of these methods is that described and claimed by applicant, in which a mixture of the oleic acid and light, voluminous, nickelized kieselguhr is agitated in the presence of, or thrown up into an atmosphere of compressed hydrogen, within a closed vessel.

967

The invention of this application is similar to that of Ser. No. 423,366, the novelty and patentability of which have been conceded, being specifically limited, however, to the use of a light, voluminous catalyzer of nickel and an inert support, which can be readily maintained in suspension in and distributed throughout the liquid.

Reconsideration is requested.

Respectfully,

EDWIN C. KAYSER,

By Byrnes, Townsend & Brickenstein,

Attys.

Div. 3 Room 169. 2-260 Paper No

"The Commissioner of Patents, Washington, D. C." and not any official by name.

All communications regarding this application should give the serial number, date of filing, title of invention, and name of the applicant.

DEPARTMENT OF THE INTERIOR

UNITED STATES PATENT OFFICE

WASHINGTON March 31, 1911

Mailed

Edwin Cuno Kayser,

Care, Byrnes, Townsend & Brickenstein,

Washington, D. C.

Please find below a communication from the EXAMINER in charge of the application of your

No. 544,630, Methods of Saturating Fatty Acids or their Glycerides with Hydrogen, filed Feb. 18, 1910.

E. B. Moore,

Commissioner of Patents.

This case has been reconsidered in connection with the amendment of March 15, 1911.

The German patent to Knorre, 172,890, (87-13, Transformation), discloses a process for reducing oleic acid by stirring an emulsion of the acid and formaldehyde together with zinc dust. The patent also discloses that nickle may be used as a substitute for zinc dust. It further discloses on page 2 that it is known to be old to reduce unsaturated fatty bodies in the presence of finely divided metal by the use of hydrogen. The claims are therefore rejected as defining nothing patentable over the disclosure of this reference.

Ely

E. M. H. Examiner

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APPLICATION ROOM
APR
14
1911
U. S. Patent Office.

U.S.Patent Office, Serial No. 544,630
RECEIVED
APR 15 1911
Division 31, Paper No. 13 6

Room 169.

Edwin Cuno Kayser,

Filed Feb. 18, 1910,

Ser. No. 544,630,

"Methods of Saturating Fatty Acids or their Glycerides with Hydrogen".

Washington, D.C., April 14, 1911

Hon. Commissioner of Patents,

Sir:-

Replying to Office letter of March 31, 1911:

Amendment is made as follows:

Claims 1, 2, 3, line 3 of each, before "mixture" insert "heated".

REMARKS.

The portions of the reference relied on are presumed to be the following:

• • •"The oleic acid or the fatty acids containing oleic acid are mixed in a liquid condition with liquid or gaseous formaldehyde, and to this emulsion there is added by degrees with continual stirring or shaking zinc powder or other finely divided metal. The mass, in the beginning thin flowing, after a short time becomes viscid and later on solid.

• • • • • • • • • • •

"Instead of zinc dust, other metals can be used, even if they do not work as promptly, such as iron, aluminum, lead, copper, platinum, nickel, silver, tin, bismuth, and the process is mostly accelerated by the addition or presence of a little oxid of the metal used."

• • • • • • • • • • •

"It has already been proposed, to reduce unsaturated fatty bodies by this means, that hydrogen is allowed to act on them in the presence of finely divided metals. The action of the formaldehyde in the presence of oxide and metals leads however to essentially different technical results and appears to rest, as a matter of fact, not on a reduction, but on a precipitation. For even saturated acids give a very considerable rise in melting points. So from the treatment of palmitic acid by the process described there results a rise of the melting point from 57.8° to 103.3°."

969

"Also it has been proposed in British Patent 7169/91, to solidify liquid oleic or fatty acids by heating for hours with formaldehyde solution. As contrasted with this, this process differs essentially in the fact, that in addition to the formaldehyde, at the same time metals are used and the action of the two reagents on the fatty acids is effected at ordinary temperature."

This patent entirely fails to anticipate the claims. The zinc is presumably used as a reducing agent and not as a catalyzer, and as there is no hydrogen, it does not appear that either the zinc or any of the nine other metals mentioned as equivalents, including nickel, have any catalytic action. It is not clear why "a little oxid of the metal used" is added.

The Examiner couples up this Knorre process with the prior art, acknowledged on page 2 of the patent, of reduction by means of hydrogen and finely-divided metallic catalyzers, not agitated. This is manifestly illegitimate, especially as the patentee states that his process "leads however to essentially different technical results and appears to rest, as a matter of fact, not on a reduction, but on a precipitation."

The reference entirely fails to describe or suggest the distinctive feature of this application, that is, the use of a light, voluminous, finely-divided, inert support for the catalytic metal, enabling the catalyzer to be readily and evenly maintained in suspension.

As a further distinction from the Knorre patent, in which the operation is carried out at ordinary temperatures, the claims have been limited to the treatment of the material while heated, the use of heat being essential to commercial reduction by hydrogen and a catalyzer, even under the otherwise effective condition originated by applicant.

Reconsideration is requested.

Respectfully,
EDWIN CUNO KAYSER,
By Byrnes, Townsend & Brickenstein, Attys

970

Div. 31 Room 169

"The Commissioner of Patents, Washington, D. C.," and not any official by name.

2-200

Paper No. 7

All communications concerning this application should give the serial number, date of filing, title of invention, and name of the applicant.

DEPARTMENT OF THE INTERIOR

UNITED STATES PATENT OFFICE

WASHINGTON May 2, 1911.

MAILED

Edwin Cuno Kayser,

Care, Byrnes, Townsend & Brickenstein,

Washington, D. C.

Please find below a communication from the EXAMINER in charge of your application of

No. 544,630, Methods of Saturating Fatty Acids or their Glycerides with Hydrogen, filed Feb. 18, 1910.

E. B. Moore,

Commissioner of Patents.

This case has been reconsidered in connection with the amendment of April 14, 1911.

The specification should contain a specific example giving the quantities of the materials that are suitable for the carrying out of the process described. Pending the compliance with this requirement and the filing of appropriate drawings, as previously required, allowance is deferred.

Ely

W. H. H. Examiner.

APPLICATION ROOM
SEP
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1911
U.S.PATENT OFFICE.

U.S.Patent Office,Serial No.544630
RECEIVED
SEP 13 1911
Division 31, Paper No. 8

Room 189.

Edwin Cuno Kayser,

Filed Feb. 18, 1910, Ser. No. 544,630,

"Methods of Saturating Fatty Acids or their Glycerides with Hydrogen."

Washington, D. C., Sept.11th-1911

Hon. Commissioner of Patents,

Sir:-

In view of Office letter of May 8, 1911, amendment is made as follows:

Enter the accompanying drawing.

At the end of the description, page 5, after line 13, insert:

"Suitable apparatus for carrying out the process is shown in the accompanying drawing, in which -

Figure 1 is a vertical axial section; and

Figure 2 is a vertical transverse section on the line II-II of figure 1.

The apparatus illustrated comprises a stationary horizontal cylinder 1, having a manhole 2 for the introduction of oil and catalyzer, a steam jacket 3, hydrogen supply - and discharge-pipes 4,5, and revolving wire-gauze beaters or agitators 6, carried by a central shaft 7 journaled in stuffing-boxes 8 in the ends of the cylinder. Hydrogen is supplied to the compression-pump 9 through a pipe 10 having a three-way or other cock 11. The unabsorbed excess of hydrogen escaping from the drum through the pipe 5 passes a weighted relief-valve 12 and is thence returned by a pipe 13 to the pump. The liquid mixture of oil and catalyzer to be treated in the cylinder is indicated by the line 14. The product is delivered through the tap 15 having the cock 16.

In practice, the oil to be hydrogenized, for example cotton-seed oil, is preferably charged into the cylinder through the manhole 2 to about the level indicated. A relatively small amount of the nickelized catalyzer, usually less than one per cent. by weight of the oil, is also introduced. The mixture is then heated by steam in the jacket 3 to a temperature of about 150° to 160° C. Hydrogen is pumped into the cylinder through the pipe 4, the unabsorbed excess escaping through the pipe 5 and relief-valve 12, and the wire-gauze beaters are set in motion. The heat, supply of hydrogen and agitation are continued until the oil has been hydrogenized to the desired degree, as shown by its consistency or by determination of its titre and iodine value, usually for several hours and until it has been converted into a product which is solid or semi-solid when cold. The cock 16 is then opened, the mixture of hydrogenized oil and catalyzer is run out through the tap 15, and the catalyzer is filtered out for re-use."

Allowance is requested.

Respectfully,

EDWIN CUNO KAYSER,

By Byrnes, Townsend & Brickenstein,

Attys.

ADDRESS ONLY THE COMMISSIONER OF PATENTS, WASHINGTON, D. C.

K.C'D

S-381.

Serial No. 544,630.

DEPARTMENT OF THE INTERIOR

UNITED STATES PATENT OFFICE

WASHINGTON Oct. 5, 1911.

Edwin Cuno Kayser, Assor,

Byrnes, Townsend & Brickenstein,

Washington, D. C.

Sir: Your APPLICATION for a patent for an IMPROVEMENT in Method of Saturating Fatty Acids or Their Glycerides with Hydrogen,

filed Feb. 18, 1910 has been examined and ALLOWED.

The final fee, TWENTY DOLLARS, must be paid not later than SIX MONTHS from the date of this present notice of allowance. If the final fee be not paid within that period the patent on this application will be withheld, unless renewed with an additional fee of $15, under the provisions of Section 4897, Revised Statutes.

The office delivers patents upon the day of their date, and on which their term begins to run. The printing, photolithographing, and engrossing of the several patent parts, preparatory to final signing and sealing, will require about four weeks, and such work will not be undertaken until after payment of the necessary fee.

When you send the final fee you will also send, DISTINCTLY AND PLAINLY WRITTEN, the name of the INVENTOR and TITLE OF INVENTION AS ABOVE GIVEN, DATE OF ALLOWANCE (which is the date of this circular), DATE OF FILING, and, if assigned, the NAMES OF THE ASSIGNEES.

If you desire to have the patent issue to ASSIGNEES, an assignment containing a REQUEST to that effect, together with the FEE for recording the same, must be filed in this office on or before the date of payment of final fee.

After issue of the patent uncertified copies of the drawings and specifications may be purchased at the price of FIVE CENTS EACH. The money should accompany the order. Postage stamps will not be received.

Final fees will NOT be received from other than the applicant, his assignee or attorney, or a party in interest as shown by the records of the Patent Office.

Respectfully,

E. B. Moore.

Commissioner of Patents

IN REMITTING THE FINAL FEE GIVE THE SERIAL NUMBER AT THE HEAD OF THIS NOTICE.

UNCERTIFIED CHECKS WILL NOT BE ACCEPTED.

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BERLIN MILLS CO. VS. PROCTER & GAMBLE CO.

$ 20 RECEIVED

OCT 16 1911 CHIEF CLERK U S PATENT OFFICE

9—327.

MEMORANDUM
OF
FEE PAID AT UNITED STATES PATENT OFFICE.

(Be careful to give correct Serial No.)

Serial No. 544,630, *191*

INVENTOR:

Edwin C. Kayser

PATENT TO BE ISSUED TO

As Assigned

NAME OF INVENTION, AS ALLOWED:

Methods for Saturating Fatty Acids or Their Glycerides with Hydrogen

DATE OF PAYMENT:

Oct. 16, 1911

FEE:

Final Gov't Fee, $20.00

DATE OF FILING:

Feb. 18, 1910

DATE OF CIRCULAR OF ALLOWANCE:

Oct. 5, 1911

The Commissioner of Patents will please apply the accompanying fee as indicated above.

BYRNES, TOWNSEND & BRICKENSTEIN
Attorneys.

SEND PATENT TO BYRNES, TOWNSEND & BRICKENSTEIN, PATENT LAWYERS, 918 F STREET, WASHINGTON, D. C.

RDS 2-161. SERIAL NO. 544,630.

DEPARTMENT OF THE INTERIOR
UNITED STATES PATENT OFFICE
WASHINGTON

975

Oct.17,1911.

Edwin Cuno Kayser, assor.,
c/o Byrnes, Townsend and Brickenstein,
Washington, D. C.

PATENT
NOV 14 1911
WILL ISSUE

Sir:

You are informed that the final fee of TWENTY DOLLARS has been received in your application for Improvement in Method of Saturating Fatty Acids or Their Glycerides with Hydrogen.

Date of receipt Oct. 16, 1911.

Very respectfully

E. B. Moore
Commissioner of Patents.

4A

Washington, D. C., Dec. 12, 1911.

Hon. Commissioner of Patents,

Sir:-

The assignment by Edwin Cuno Kayser to The Procter and Gamble Company of the subject-matter of U. S. letters patent No. 1008474 is incorrectly recorded in the assignment records, Liber R83, page 229, in that the name of the assignee is copied, in each instance, as "The Proctor and Gamble Company"; also the same error appears in the name of the assignee company, in the heading of the letters patent.

We return herewith the original assignment and the letters patent, and respectfully request that you will have the assignment records corrected and a certificate of correction applied to the patent, under rule 170.

Respectfully,

BYRNES, TOWNSEND & BRICKENSTEIN.
E A Byrnes.

EAE.NPL
(ENCLOS.)

Recorded, Vol. 193 p. 49
U. S. Patent Office,
January 4, 1913.
Certificate of correction
will be endorsed on Letters Patent
No. 1,008,474, as requested.

E B Moore
Commissioner.

49

976

ADDRESS ONLY
THE COMMISSIONER OF PATENTS
WASHINGTON, D. C.

Letter No. 235883

DEPARTMENT OF THE INTERIOR

UNITED STATES PATENT OFFICE

WASHINGTON

December 30, 1911.

In the matter of
Letters Patent No. 1,008,474,
Issued November 14, 1911,
Edwin Cuno Kayser,
Byrnes, Townsend and Brickenstein, Attorneys.

REPORT OF THE ACTING CHIEF OF THE ISSUE AND GAZETTE DIV.

The Letters Patent are returned by the attorneys who state that the name of the assignee should be The Procter and Gamble Company instead of "The Proctor and Gamble Company"

Examination of the record shows that the name was first indorsed upon the file-jacket by the Assignment Division as "Procter" but was afterwards changed by the Assignment Division to "Proctor". This change was questioned by this Division and the Assignment Division was notified that the correct spelling of the name was Procter but the Assignment Division stated that their records read "Proctor". See report from Assignment Division in file.

Very respectfully,

H B Burch

Acting Chief Issue and Gazette Divisn

To the

Honorable Commissioner of Patents.

ADDRESS ONLY THE COMMISSIONER OF PATENTS WASHINGTON, D. C.

LETTER NO.

C. T. B. DEPARTMENT OF THE INTERIOR W. B. M.

UNITED STATES PATENT OFFICE

WASHINGTON

January 3rd, 1912.

In the matter of
Letters Patent No. 1,008,474,
Issued November 14th, 1911,
Edwin Cuno Kayser,
Method of Saturating Fatty Acids
or their Glycerids with Hydrogen.

The records in Liber R 83, page 229 of Transfers of Patents, the digest of assignments, and the indorsement on the file agreed in the name of the assignee as The Proctor and Gamble Company.

The original recorded assignment has been returned, and as the name therein is very plainly The Procter and Gamble Company, the records of the Office have been corrected to agree therewith.

An indorsement in red ink has been made upon the file wrapper, from which a Certificate of Correction may be furnished.

Very respectfully,

Willis R. Magruder

Chief Assignment Division.

To the

Hon. Commissioner of Patents.

Serial No. Filer No

Letter No.

ADDRESS ONLY
THE COMMISSIONER OF PATENTS
WASHINGTON, D. C.

EEC

DEPARTMENT OF THE INTERIOR

UNITED STATES PATENT OFFICE

WASHINGTON January 4, 1912.

In the matter of the
Patent of
Edwin Cuno Kayser,
Methods of Saturating
Fatty Acids or Their
Glycerides with Hydrogen;
Patented Nov. 14, 1911,
Patent No. 1,008,474.

Request for Certificate of Correction.

Sir:

You are hereby informed that the above request has been granted by the Commissioner.

By direction of the Commissioner:

Very respectfully,

W. F. Woolard

Chief Clerk.

Edwin Cuno Kayser,
c/o Byrnes, Townsend & Brickenstein
918 F. St. N.W.,
Washington, D. C.

LH

235883

January 25, 1912.

Messrs. Byrnes, Townsend & Brickenstein,

Washington, D. C.

Gentlemen:

Herewith please find Letters Patent No. 1,008,474, issued November 14, 1911, upon the application of Edwin Cuno Kayser, for Methods of Saturating Fatty Acids or Their Glycerids With Hydrogen, returned with certificate of correction indorsed thereon in accordance with your request.

Assignment received with the patent returned also.

Very respectfully,

67

Chief Clerk.

87 OILS, FATS AND GLUE.
Refining Fat oils.

1910

CONTENTS:

Print----------

1.	Application----\--papers.		26.
2.	Asso. Power of atty Mch 1 1910		27.
✓3.	Rej.	Mch. 15, 1910	28.
✓4.	Amendt A	Mch. 15. 1911	29.
✓5.	Rej.	Mch. 31, 1911	30.
✓6.	Amendt B	April 14. 1911	31.
7.	Letter	May 2, 1911	32.
8.	Amendt. C	Sept 11. 1911	33.
9.			34.
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11.			36.
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23.			48.
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Here follows diagram marked p. 981

BERLIN MILLS CO. VS. PROCTER & [illegible] Co.

P. 981 677

E. C. KAYSER.

METHOD OF SATURATING FATTY ACIDS OR THEIR GLYCERIDS WITH HYDROGEN.

APPLICATION FILED FEB. 18, 1910.

1,008,474. Patented Nov. 14, 1911.

Fig. 1.

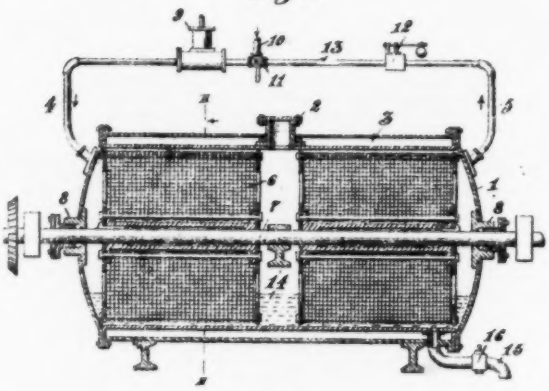
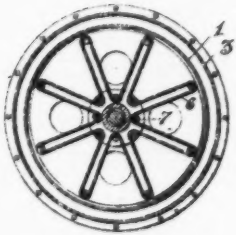


Fig. 2.



Witnesses:
N. P. Leonard.
C. H. Potter.

Inventor:
Edwin Ewins Kayser,
by Cushman, Townsend & Brock Franklin
Attys

982

UNITED STATES PATENT OFFICE.

EDWIN CUNO KAYSER, OF CINCINNATI, OHIO, ASSIGNOR TO THE PROCTOR AND GAMBLE COMPANY, OF CINCINNATI, OHIO, A CORPORATION OF OHIO.

METHOD OF SATURATING FATTY ACIDS OR THEIR GLYCERIDS WITH HYDROGEN.

1,008,474. Specification of Letters Patent. Patented Nov. 14, 1911.

Application filed February 18, 1910. Serial No. 544,630.

To all whom it may concern:

Be it known that I, EDWIN CUNO KAYSER, a subject of the King of Great Britain, and a resident of the city of Cincinnati, in the county of Hamilton and State of Ohio, United States of America, have invented certain new and useful Improvements in Methods for Saturating Fatty Acids or Their Glycerids with Hydrogen, of which the following is a specification.

It is by now well known that unsaturated fatty acids, their glycerids or other esters, in the fluid state, can be made to absorb gaseous hydrogen, until they become converted into the corresponding semi-saturated or saturated compounds, by the intervention of certain finely divided metals, nickel in particular. For that purpose, the nickel-powder is kept in suspension in the hot oil or fatty acid, while hydrogen gas is passed through, or otherwise brought in suitable contact with, the mixture.

In order to sufficiently expedite the transfer of hydrogen for practical purposes, considerable quantities of nickel have to be present. This metal must take the form of an almost impalpable powder and in consequence, when it comes to its separation from the product of reaction, it will be found to form an almost impenetrable sediment on the filter cloth, a fact greatly interfering with the technical applicability of the process. Moreover, for reasons but imperfectly understood, but apparently due to the deposition thereon of carbonaceous by-products, such pure metal soon loses its catalytic activity and cannot be made to repeatedly answer its purpose.

In the catalytic production of sulfuric acid, and in similar industrial processes, where reaction between gases is to be induced, it is customary to spread the catalytic metal or other catalyzer over fibrous materials like asbestos, over fragments of brick or the like inert materials. Since the "catalyst" in these cases remains stationary, such measures are obviously necessary in order to facilitate the transverse movement of the gas through the catalyzer, or in order to produce more contact than a mere passage over a pulverous layer of metal would afford. In the present instance, however, when the metallic particles are already kept apart and readily accessible by their suspension in a liquid medium, it would be considered unnecessary to disseminate such metal over an inert vehicle and the presence of the latter would be judged more likely to impede than to facilitate the reaction. I have, notwithstanding this, ascertained, however, that nickel firmly and evenly deposited upon a voluminous, pulverous inert material exercises in a fluid medium a far more energetic action, and much longer retains its vitality than an equal weight of a pure metal in the finest state of division procurable. The method of thus depositing on or coating the pulverous inert material with the nickel powder forms no part of my present invention, which relates to the use of such pulverous nickelized material in the saturation of oils and fats with hydrogen. It will, therefore, be sufficient to state that in order to prepare my catalytic agent, I bring suitable soluble or insoluble compounds of nickel in an appropriate manner into intimate combination with an inert absorptive and comparatively bulky mineral substance such as kieselguhr. I then dry and comminute the product, and reducing the powder thus produced with hydrogen, a highly efficient and reliable nickelized, inert pulverous material is the result.

In order to carry out my process, I introduce into a suitable closed receptacle a quantity of the mixture of my fatty material and the pulverized, nickelized inert support, and by means of paddles or stirrers, I thoroughly agitate the mixture while introducing the hydrogen. The vessel may either be filled with the charge, in which case the gas has to be atomized within the fluid, or the vessel may be only partly filled, so as to permit the agitators or paddles to propel or project the charge into a surrounding atmosphere of hydrogen. By preference, the hydrogen is supplied under pressure, but a certain amount is always allowed to continuously escape in order to carry off generated steam and other gaseous by-products.

983

Under suitable precautions, water gas or other gas mixture sufficiently rich in hydrogen gas may be used in place of pure hydrogen. When pure hydrogen is used, under artificial pressure, the gas outlet should be closed by a weighted valve, and the gas supply so regulated as to constantly maintain the desired pressure.

The temperature of the oil mixture may vary within considerable limits. A temperature from one hundred and fifty degrees centigrade to one hundred and sixty degrees centigrade will, as a rule, be found desirable.

The great technical advantage secured by my process in which the nickel powder is firmly and evenly distributed upon the voluminous, pulverous inert material, when mixed with the oil or fat to be treated, may in part be attributed to the ultra-division of the metal, attainable by suitable chemical incorporation, with the inert vehicle, wherein it approaches the colloidal state. It may, however, with equal force be ascribed to a direct coöperation between metal and "inert" body, the latter, present in preponderating quantity and volume, absorbing the hydrogen in the first instance and then yielding it to the metal, which in turn transmits it to the fatty body. The prolonged vitality of the catalyzer may on the other hand be due either to a modified action of the disseminated metal and to a diminished formation of by-products, or to the retention thereof by the inert vehicle, or finally to the more constant physical structure of the metallic particles. Whatever be the cause of the increased activity and prolonged vitality of the metalliferous pulverous catalyzer over the pure metal, the direct technical advantage attained by the change is sufficiently conspicuous. This advantage is further advanced by two other factors, greatly pronounced when using a vehicle like kieselguhr, namely the comparatively low specific gravity and the easy permeability of the catalyzer. The former greatly facilitates suspension in the surrounding fluid, the latter renders rapid and neat separation from the fatty substance by the conventional use of the filter-press an easy matter. Finally, the inert material, which forms by far the principal constituent of a well-made catalyzer, exercises a decolorizing and deodorizing action upon the material treated, far beyond that observed with an equal proportion of pure metal.

Suitable apparatus for carrying out the process is shown in the accompanying drawing, in which—

Figure 1 is a vertical axial section; and Fig. 2 is a vertical transverse section on the line II—II of Fig. 1.

The apparatus illustrated comprises a stationary horizontal cylinder 1, having a manhole 2 for the introduction of oil and catalyzer, a steam jacket 3, hydrogen supply- and discharge-pipes 4, 5, and revolving wire-gauze beaters or agitators 6, carried by a central shaft 7 journaled in stuffing-boxes 8 in the ends of the cylinder. Hydrogen is supplied to the compression-pump 9 through a pipe 10 having a three-way or other cock 11. The unabsorbed excess of hydrogen escaping from the drum through the pipe 5 passes a weighted relief-valve 12 and is thence returned by a pipe 13 to the pump. The liquid mixture of oil and catalyzer to be treated in the cylinder is indicated by the line 14. The product is delivered through the tap 15 having the cock 16.

In practice, the oil to be hydrogenized, for example cotton-seed oil, is preferably charged into the cylinder through the manhole 2 to about the level indicated. A relatively small amount of the nickelized catalyzer, usually less than one per cent. by weight of the oil, is also introduced. The mixture is then heated by steam in the jacket 3 to a temperature of about 150° to 160° C. Hydrogen is pumped into the cylinder through the pipe 4, the unabsorbed excess escaping through the pipe 5 and relief-valve 12, and the wire-gauze beaters are set in motion. The heat, supply of hydrogen and agitation are continued until the oil has been hydrogenized to the desired degree, as shown by its consistency or by determination of its titre and iodin value, usually for several hours and until it has been converted into a product which is solid or semi-solid when cold. The cock 16 is then opened, the mixture of hydrogenized oil and catalyzer is run out through the tap 15, and the catalyzer is filtered out for re-use.

What I claim as new, and of my invention and desire to secure by Letters Patent, is:—

1. The process of hydrogenizing fatty acids and their esters, which consists in agitating in the presence of hydrogen a heated mixture of the fatty acid or ester and a pulverulent catalyzer consisting of a light, voluminous, finely-divided, inert support impregnated with an active metal, whereby the catalyzer is maintained in suspension and the acid or ester and hydrogen are brought into intimate contact with the active surfaces of said catalyzer.

2. The process of hydrogenizing fatty acids and their esters, which consists in mechanically subdividing and agitating, in the presence of an atmosphere of hydrogen, a heated mixture of the fatty acid or ester and a pulverulent catalyzer consisting of a light, voluminous, finely-divided, inert support impregnated with metallic nickel, whereby the catalyzer is maintained in suspension and the acid or ester and hydrogen are brought into intimate contact with the active surfaces of said catalyzer.

984

2. The process of hydrogenizing fatty acids and their esters, which consists in repeatedly projecting or propelling into an atmosphere of compressed hydrogen portions of a heated mixture of the fatty acid or ester and a pulverulent catalyzer consisting of a light, voluminous, finely-divided, inert support impregnated with an active metal.

EDWIN CUNO KAYSER.

Attest:
ARTHUR H. EWALD,
EARL W. GRIFFIN.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

Correction in Letters Patent No. 1,008,474.

It is hereby certified that the name of the assignee in Letters Patent No. 1,008,474, granted November 14, 1911, upon the application of Edwin Cuno Kayser, of Cincinnati, Ohio, for an improvement in "Methods of Saturating Fatty Acids or Their Glycerids With Hydrogen," was erroneously written and printed "The Proctor and Gamble Company," whereas it should have been written and printed *The Procter and Gamble Company;* and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 16th day of January, A. D., 1912.

[SEAL.]

C. C. BILLINGS,
Acting Commissioner of Patents.

Here follow diagram marked p. 985

(986)

985

H. K. MOORE.

PROCESS AND APPARATUS FOR HYDROGENATING UNSATURATED COMPOUNDS.

APPLICATION FILED FEB. 26, 1914.

1,121,860. Patented Dec. 22, 1914.

2 SHEETS—SHEET 1.

Fig. 1.

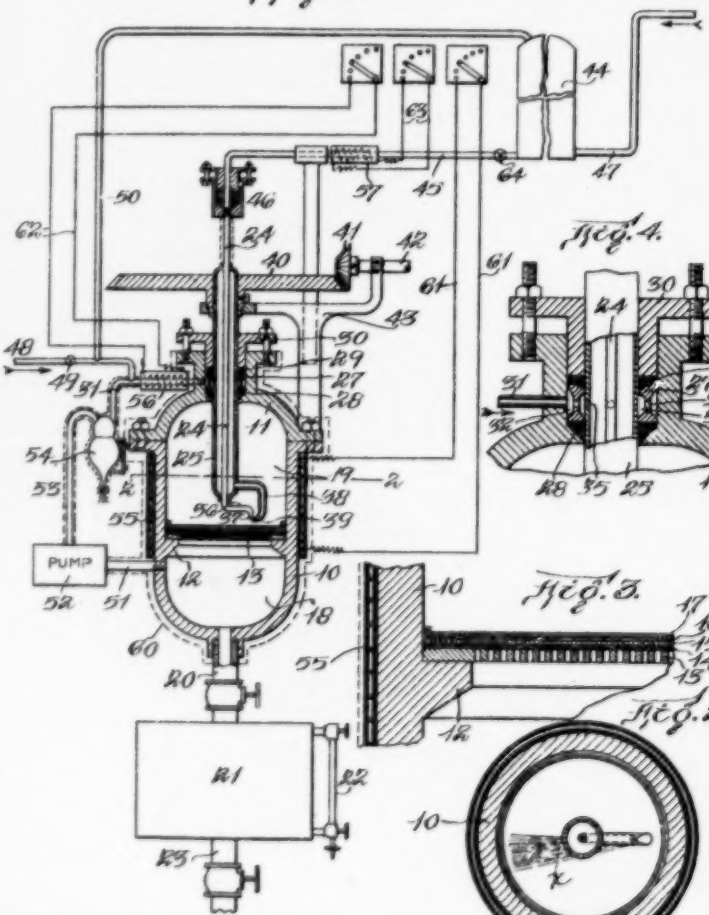


Fig. 4.

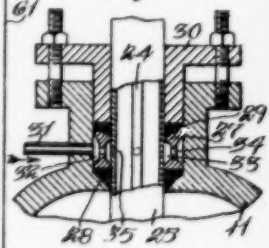
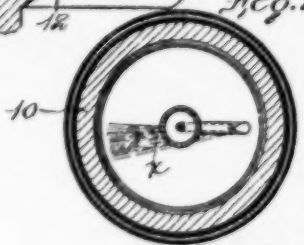


Fig. 3.

Fig. 2.



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H. A. Rahn

Inventor:
Hugh K. Moore
by Wright Brown Quinby & May
Attorneys

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Berlin Mills v. Proc & G Co

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BERLIN MILLS CO. VS. PROCTER & GAMBLE CO.

985

H. K. MOORE.

PROCESS AND APPARATUS FOR HYDROGENATING UNSATURATED COMPOUNDS.

APPLICATION FILED FEB. 26, 1914.

1,121,860.

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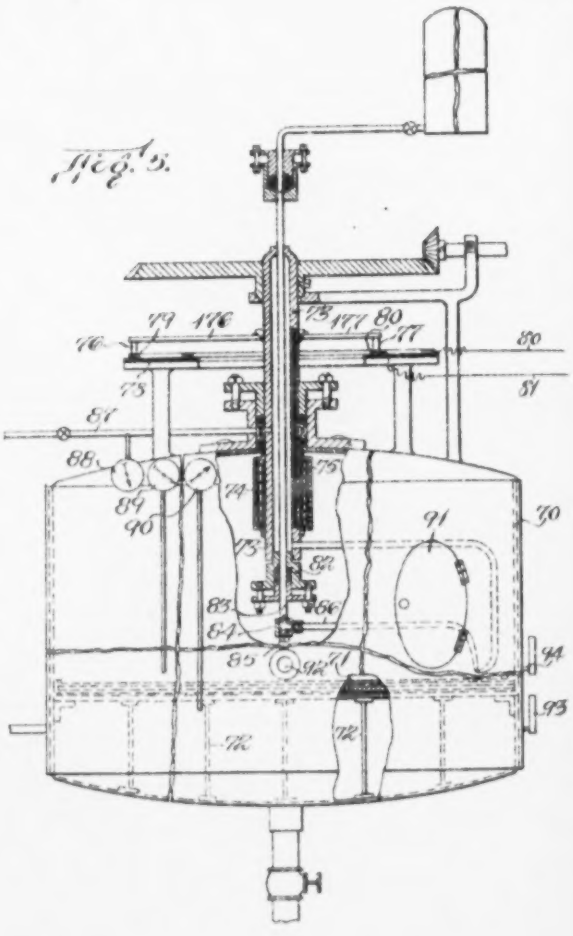
2 SHEETS—SHEET 1.

Fig. 1.



Witnesses.
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H. A. Rahn

Inventor.
Hugh K. Moore
by Lemp & Brown Dunlap, Ills
Attorneys

UNITED STATES PATENT OFFICE.

HUGH K. MOORE, OF BERLIN, NEW HAMPSHIRE.

PROCESS AND APPARATUS FOR HYDROGENATING UNSATURATED COMPOUNDS.

1,121,860. Specification of Letters Patent. Patented Dec. 22, 1914.

Application filed February 26, 1914. Serial No. 821,241.

To all whom it may concern:

Be it known that I, HUGH K. MOORE, a citizen of the United States, and a resident of Berlin, in the county of Coos and State of New Hampshire, have invented certain new and useful Improvements in Processes and Apparatus for Hydrogenating Unsaturated Compounds, of which the following is a specification.

This invention has for its object to provide a continuous process of hydrogenating oils, the glycerids of fatty acids, the fatty acids and other unsaturated compounds.

On the accompanying drawings, Figure 1 represents more or less diagrammatically an apparatus which I have invented and which may be utilized in carrying out my process. Fig. 2 represents a section on the line 2—2 of Fig. 1. Fig. 3 represents an enlarged section through the diaphragm containing the catalyzer. Fig. 4 represents in detail the connection at the top of the hydrogenation chamber. Fig. 5 represents another form of apparatus for carrying out my process.

For simplicity of phraseology, I shall, in the following specification and claims, refer to the compound to be hydrogenated as "oil," but it will be understood that I mean to include thereby any unsaturated compound, such for instance as the glycerids of fatty acids, the fatty acids, the esters of the fatty acids or any unsaturated hydrocarbons or other unsaturated compounds.

With the forms of apparatus which I have herein shown, I preferably atomize the oil by a blast of hydrogen and bring the mixture of hydrogen and finely divided oil into the presence of and in contact with a catalyzer.

The oil is furnished in a continuous stream into the upper portion of a closed chamber, where it meets the continuous stream or blast and is atomized. The chamber is provided with a pervious filtering diaphragm containing a catalyzer, and the mixture of oil and hydrogen in excess penetrates the diaphragm into contact with the catalyzer whereupon the oil is saturated, and the hydrogenated oil and the excess of hydrogen pass into the lower portion of the chamber. The excess hydrogen may then be freed of oil and reused, and the hydrogenated product withdrawn in a continuous stream. Preferably, as will be subsequently explained, for securing the greatest possible active surface, the catalyzer consists of a layer of finely divided or pulverulent material confined between layers of filtering material. It is difficult to force a large body of oil through such powdery mass, but, when the oil is atomized, it may be forced therethrough without difficulty if the pressure be sufficient. I therefore maintain on two sides of the diaphragm atmospheres of hydrogen, under different pressures, so that a stream of hydrogen is constantly passing through the diaphragm and catalyzer in the direction in which the oil is passed through.

I have found that proper results cannot be obtained after the particles of the catalyzer become covered with films of oil, for the reason that the hydrogen is unable to obtain access thereto, and hence I provide for cleaning the catalyzer of the oil and revivifying it. This is accomplished by causing the constant passage of hydrogen therethrough, and also by arranging the nozzles for the oil and hydrogen in such manner and so moving them that the spray is directed progressively toward restricted areas of the catalyzer. Hence, through that portion of the catalyzer which at the moment is not receiving the spray, hydrogen is passing through in such quantities and at such velocity as to blow off or remove the films or coatings of oil which inclose the particles thereof. Thus each restricted portion of the catalyzer first receives the mixture of oil and hydrogen, and is then freed of the oil, either as such or in saturated or partially saturated condition. Moreover, by so doing, the quantity of oil which any one portion of the diaphragm and the catalyzer is receiving is relatively small, and the oil is so broken up and mixed with the hydrogen that it is carried therethrough and hydrogenated instantaneously. By regulating the oil supply, I am able to regulate the degree of solidity of the hydrogenated product to any predetermined point according to the use for which it is intended.

I wish to have it clearly understood that

my invention is capable of being practised in many ways, that I am not limited to the employment of the particular forms of apparatus which I have illustrated and shall hereinafter describe, and that the phraseology which I have adopted is for the purpose of description and not of limitation. I have shown on the drawings certain forms of apparatus which are best now known by me for carrying out my process, but I have not attempted to show them in their exact proportions or relative sizes.

Referring to the drawings and particularly to Fig. 1, a small size apparatus is shown capable of producing about 150 pounds of hydrogenated oil per day of 24 hours. This apparatus consists of a cast metal casing 10 having a cover 11 to form a substantially cylindrical chamber. The chamber is transversely divided or partitioned by a filter diaphragm containing the catalyzer. As shown, the casing has an interior flange 12 upon which the diaphragm rests. The diaphragm, as illustrated, consists of a perforated plate 13 upon which rests a layer 14 of wire cloth, preferably about 100-mesh. Upon the wire cloth is a thin layer 15 of suitable inert material such as a mat of asbestos fiber, or asbestos paper or cloth, or other filtering material which will not decompose under the influence of the heat in the casing or dissolve in the oil. Then, upon the layer of asbestos is a thin layer 16 of the catalyzer, and upon this is superimposed another layer 17 such as asbestos, or a layer of wire cloth of a very fine mesh. The lower layer 15 operates as a filter to prevent the catalyzer from passing through it, the upper layer 17 serving to hold the catalyzer in place and protect it from being displaced by the blast of the oil and hydrogen. The perforated plate and the wire cloth are merely for the purpose of sustaining the weight of the layers above them and against the pressures to which they are subjected from above. I do not confine myself, however, to the particular form of diaphragm which I have described, as any other form which is impervious to the catalyzer and pervious to the oil and hydrogen may be employed.

As a catalyzer I may employ substantially any of the usual metals, such as palladium, platinum, copper, nickel, iron, etc., although I prefer to use nickel. These materials may be termed "metallic" catalyzers, although by such term I do not mean necessarily that the substances are in their metallic forms, since they may be present as hydrids or salts of the metals. In making the diaphragm, a layer of nickel in the form of oxid is spread to the proper thickness upon the layer 15 of asbestos, the oxid being in finely divided condition, preferably so that it will pass through a 100-mesh sieve. After the diaphragm is formed, the oxid is reduced by hydrogen at a temperature of approximately 570° F. In lieu of first using the catalyzer in the form of an oxid, before its reduction by hydrogen, I may use any other suitable metallic compound, such as the nitrite, the nitrate, the hydrate, the formate, the oxalate, etc., of the metal. While I am unable completely to substantiate it, to my satisfaction, I am of the opinion that the catalyzer, after being treated as described, is in the form of nickel hydrid rather than nickel in a nascent state. I have hereinafter stated several reasons.

The diaphragm divides the chamber within the casing into two compartments 18 and 19, and from the lower compartment 18 leads a valved conduit 20 for the hydrogenated product. The conduit communicates with a receptacle 21 having a gage 22 and provided with a valved discharge outlet 23, leading to a trap (not shown) whereby the outflow of hydrogenated product may be continuous.

The oil and the hydrogen are introduced into the upper compartment 19 through the cover 11 by concentric pipes. The oil pipe is indicated at 24 and the pipe for the hydrogen at 25. Surrounding the pipe 25, and between it and the neck 26 of the cover, there is a chambered collar or lantern gland 27 located between packings indicated at 28, 29. The follower 30 is secured to the neck in the usual fashion. Hydrogen is introduced through the neck of the cover by a pipe 31 which opens into the outer chamber 32 formed by the lantern gland and passes therefrom to an inner chamber 33 through radial apertures 34. The shaft 25 has an aperture 35 communicating with the inner chamber 33. The upper and lower ends of the pipe 25 are preferably closed and welded to the pipe 24. The lower end of the pipe 24 has a lateral extension 36 terminating in a narrow slit or nozzle 37, and from the pipe 25 there is a lateral extension 38 terminating in a nozzle 39 closely adjacent the nozzle 37. By an examination of Fig. 2, it will be observed that these nozzles are so located that the stream or blast of hydrogen, traveling at high velocity, impinges upon or engages the stream of oil flowing from the nozzle 37 and atomizes the latter, directing the spray across the surface of the diaphragm. In outline and in plan view, the spray is in the form of a segment with one outer radius approximately intersecting the axis or median longitudinal line of the casing as indicated at x. Instead of using only one pair of nozzles for the hydrogen and oil, I have contemplated increasing the number and of arranging them upon different radial arms, this depending of course upon the area of the diaphragm and the width of the atomized spray. I provide means for slowly rotating

the pipes 24 and 25 so as to cause the nozzles to revolve and thus direct the spray progressively in a circle over the entire surface of the diaphragm. To this end, any suitable mechanism may be utilized for effecting the rotation of the pipes. I have shown a large gear 40 intermeshing with and driven by a small bevel pinion 41 on a shaft 42. The hub of the gear 40 is secured in any suitable way to the shaft 25 and it is mounted upon a bracket 43, which also serves to form a bearing for the shaft 42. It is, of course, immaterial how the relative movements of the nozzles and the diaphragm are secured. It could be accomplished by rotating the casing and holding the nozzles stationary.

The oil is supplied from a tank 44 through a pipe 45 rotatably jointed to the shaft 24. As a matter of detail, I have shown the shaft 24 as being provided with a stuffing box 46 rigidly secured thereto so as to rotate therewith, and into the box projects the end of a pipe 45. Oil is pumped to the tank 44, as needed, through a conduit 47. The hydrogen is supplied from the tank (not shown) through a pipe 48 valved as at 49. The hydrogen is under high pressure, for instance 100 pounds to the square inch; and hence, to insure the proper delivery of the oil, I provide a branch pipe 50 leading from the pipe 48 to the top of the tank 44 to force oil therefrom under pressure. The pipe 48 is connected to the pipe 31, as shown. From the chamber 18, a circulating pipe 51 leads to a compression pump 52 which draws the hydrogen from the chamber and delivers it through a pipe 53 to a separator 54 by which it is freed from any entrained oil. The receiving end of the pipe 31 is connected to the separator so that the hydrogen is circulated through the casing, additional hydrogen being supplied as needed from the pipe 48.

I provide means for heating both the oil and the hydrogen. Any suitable heating means may be utilized for this purpose. For instance, I may employ an electric heating coil 55 encircling the casing, a like coil 56 encircling the pipe 31 for heating the hydrogen, and a similar coil 57 around the pipe 45 for heating the oil. Preferably I employ coils made of nickel chromium wire, suitably insulated by mica from the metal parts which they inclose, and incase them in a jacket or covering of any suitable heat-insulating material such as magnesia. In fact, I have shown the entire casing 10 as being inclosed in a casing 60 of magnesia or other suitable material. The several pairs of conductors 61, 61, 62, 62 and 63, 63 for the coils are connected to a suitable switchboard by which the current therethrough may be regulated to secure the desired amount of heat. I find that it is desirable that the temperature within the compartment 19 of the casing should be approximately 475° to 480° F. in making soap stock, although, of course this may vary. For edible fats, a temperature of 300° to 350° F. may be used, although a much lower temperature may be maintained if desired. Care should be taken not to heat the oil or the reduced product to a temperature at which it will burn or become carbonized. After the chamber has been heated to the proper temperature, it is possible to shut off the current through the coil 55 and to depend upon the coils 56 and 57 for furnishing sufficient heat for the reaction. In fact, as I will subsequently explain, proper results may be secured by heating only the hydrogen prior to its delivery from the nozzle. So far as I have at present observed, because of mechanical difficulties in preventing the leakage of hydrogen, the optimum pressure in the chamber 19 is approximately 60 pounds to the square inch, and the pressure in the chamber 18 is approximately 40 pounds to the square inch, although of course these pressures may vary. Assuming, for example, for complete hydrogenation, that to 1 cubic foot of pure olein about 180 cubic feet of hydrogen is required, it will be seen that it is highly desirable that the hydrogen should be supplied under high pressure so as to compact within a small space an otherwise large volume of hydrogen. It is for this reason, as well as others, that I preferably maintain the pressure in the upper compartment 19 at about 60 pounds to the square inch. These pressures may, of course, vary, but it is preferable that there should be a sufficient difference in pressure on the two sides of the diaphragm to insure the passage of the mixture through the diaphragm and the revivifying of the catalyzer, as hereinafter explained, by the blowing of hydrogen therethrough, and a sufficient difference in pressure, between the upper compartment and the supply pipe 31 to insure a powerful blast of hydrogen issuing from the nozzle for the atomization of the oil.

In operation, the oil, such as cotton-seed oil, fish oil, or the like, is fed under pressure continuously from the tank 44 through the pipes 45 and 24 to the nozzle 37. At the same time, hydrogen is continuously supplied through the pipe 31 at a pressure of approximately 80 pounds. Passing through the pipe 25 to the nozzle 39 the blast of hydrogen meets the stream of oil and breaks it up into a finely divided state or atomizes it and mixing with it blows it across a relatively restricted area of the diaphragm. The pressure of the hydrogen atmosphere in the compartment 19 is, as I have explained,

preferably approximately 60 pounds, so that the oil and hydrogen are forced through the diaphragm into intimate contact with the catalyzer, and more or less of the oil is reduced by the hydrogen. At the same time the excess hydrogen blows through that portion of the diaphragm which for the moment is not receiving the spray and removes from the particles of the catalyzer the films or coatings of oil if any remain thereon. The hydrogen, which reaches the compartment 18 (in which the atmosphere of hydrogen is at a low pressure), together with any entrained oil, is pumped therefrom by the pump 52 and through the separator 54 back to the pipe 25. The loss of hydrogen, due to its reaction with the oil, is made up by a supply of fresh hydrogen from the pipe 48, the supply being controlled by the valve 49. The hydrogenated oil, which is delivered to the compartment 18, passes therefrom into the receptacle 21 through the delivery conduit 20 and is withdrawn as required. By regulating the supply of oil from the tank 44, as by a valve 64, I am able to control the degree of solidity of the hydrogenated product. If desirable, I may deliver the product practically in a solid state or in a semi-liquid state.

It is unnecessary with my process to pass the oil through the diaphragm more than once, but of course, should the hydrogenation be not so complete as desired for any cause, it may be circulated through the spray nozzle and diaphragm by a pump and suitable pipe connections. After the product has been withdrawn from the casing or hydrogenator, it may be bleached and deodorized by any of the well-known processes, but it is unnecessary to subject it to a filter-press operation since it contains none of the catalyzer, the latter being confined and prevented from leaving the diaphragm by the asbestos or other material upon which it is placed. To insure the proper working of the apparatus and prevent the clogging of the nozzles, I find it desirable to remove any chips or scale that there may be in the oil by cleaning it or filtering it prior to its delivery to the supply tank 44.

I have already stated that I am inclined to the belief that the catalyzer is in the form of a hydrid rather than a pure metal. So far as my work has gone, I have been unable to secure any hydrogenation with a metal which does not form a hydrid, such for example as vanadium. Again, when the metal does form a hydrid, it is apparently necessary for the catalytic action for the temperature to be lower than that at which the hydrid decomposes by the action of heat. I believe that, upon reducing the oxid of the metal with hydrogen, there is secured an unstable compound such as the hydrid,—for instance, in reducing NiO with H, the theoretical consumption would be

$$NiO+4H=H_2O+NiH_2$$

instead of

$$NiO+H_2=Ni+H_2O,$$

but this hydrid has a possibility of absorbing hydrogen to form

$$NiH_4, NiH_6 \text{ and } NiH_8.$$

I have not yet isolated these latter theoretical hydrids but believe them to exist. For instance, nickel carbonyl ($Ni(CO)_4$) corresponds, if $(CO)_4$ were replaced by hydrogen, to NiH_8. I think it is the instability of these hydrids and the property of their changing from one hydrid to another, that accounts for the remarkable and confusing action which is termed catalysis in this particular instance. If my theory is correct, the hydrid NiH_4 for instance would give off 2H for the hydrogenation of the oil, leaving NiH_2, and would again be restored to NiH_4 when the hydrogen alone is supplied thereto. This belief is strengthened by the fact that it is possible to revivify the catalyzer completely in the event that the operation of the catalyzer becomes sluggish or ceases altogether. By completely shutting off the supply of oil and continuing the operation of the pump 52 so as to force the hydrogen through the diaphragm and through the catalyzer for a relatively short period of time, say half an hour, it is possible to restore the catalyzer to its initial active condition. In the operation of the apparatus as shown, there is a constant revivifying (and I believe rehydriding) of the catalyzer by forcing the hydrogen through those portions of the catalyzer which are not at the time receiving from the nozzles the mixture of hydrogen and oil. As the nozzles revolve, the atomized spray is delivered progressively over the surface of the diaphragm to those portions of the catalyzer which have been previously revivified or rehydrided. It is possible, on the other hand, that the revivifying is due to the removal of the films of oil from the particles of the catalyzer by the blast of hydrogen, but my observation is that this alone would not account for the surprising results I obtain.

The apparatus shown in Fig. 1 is more especially designed for the production of a relatively small quantity of hydrogenated oil, the casing illustrated being approximately 20 inches high and 12 inches in diameter, interior measurements.

In Fig. 5, I have illustrated an apparatus for yielding a large production of reduced compound and by which my process may be practised. In this apparatus, the casing

is made of sheet metal of proper strength and thickness to withstand the pressure, and the diaphragm 71 is supported by struts 72. Instead of heating the casing, I arrange for heating the hydrogen as it is supplied to the nozzle. To this end, I place upon the depending portion of the pipe 73, through which the hydrogen is supplied to the interior of the upper compartment of the casing, a heating coil 74. This coil is located within the upper compartment, and it is placed between layers of insulating material. The coil itself is incased within a sleeve 75 of metal, the ends of which are preferably welded to the pipe 73. The conductors from the opposite ends of the coils pass through one or more passageways formed in the wall of the pipe 73, and are connected to brushes 76, 77 on arms 78, 79 extending outwardly from the pipe 73. An annulus 78 is supported by brackets on top of the casing 70 and is provided with two rings 79 and 80 with which the brushes 77 and 76 respectively engage. Current is supplied to the rings from a suitable generator (not shown) connected with the conductors 80 and 81. To permit cleaning of the pipe 73, its lower end is closed by a stuffing box plug 82 through which the oil pipe 83 passes. At the lower end of the latter pipe, there is a T-coupling 84 closed by a screw plug 85 and connected with the extension 86 provided with the nozzle for the emission of the hydrogen and the atomization of the oil. Connected with the hydrogen pipe 87 which leads to the lantern gland, there is a pressure gage 88, there being similar gages 89 and 90 communicating with the upper and lower compartments of the casing. As a detail of construction, I prefer to provide the casing with a manhole closed by a door 91, which, when open, permits access to the interior of the casing. I also use recording thermometers of any suitable description for recording the temperatures of the compartment of the casing. One or more peepholes, closed by layers of glass, protected by mica as indicated at 92, may be provided for permitting an inspection of the nozzles and the formation of the spray.

So far as I am aware, I am the first to have provided any practical process for effecting a continuous, as opposed to an intermittent, hydrogenation of oil, and particularly of the glycerids of the fatty acids such as olein and the like. The hydrogenation, considered as a whole, is continuous although it takes place in successive portions of the diaphragm. In each portion of the diaphragm, as the mixture of hydrogen and oil meets the catalyzer, the reaction is practically instantaneous, and the hydrogenated product is immediately forced through and out of the diaphragm into the lower compartment, and such portion of the catalyzer is revivified for the next charge by the passage of hydrogen therethrough.

One of the many advantages which is secured by the process which has been herein outlined, is that it is wholly unnecessary to subject the oil to any handling or beating or shaking. It may be supplied from any storage tanks directly to the supply tank 44 and passes directly therefrom into the casing where it is immediately hydrogenated, so that its physical and chemical qualities are in no wise impaired. Furthermore, by my process, I prevent the breaking down of the glycerids to their fatty acids where olein and like oils are being treated. Furthermore, I may call attention to the fact that a relatively very small quantity of the catalyzer is necessary. For instance, in the apparatus shown in Fig. 1, the entire diaphragm, including the supporting plate need not be over $\frac{3}{4}$ of an inch in thickness, in which case of course the layer of catalyzer is not over $\frac{1}{4}$ of an inch in thickness. Of course care must be taken to insure the integrity of the layer of the catalyzer so that it will not be missing in any portion of the diaphragm. Approximately 5 ounces of nickel will serve for an apparatus such as shown in Fig. 1. In the apparatus shown in Fig. 5, the layer of the catalyzer need be no thicker than in the first-described hydrogenator though of course it may be thicker if desired. With the second form of apparatus in which the casing is approximately 6 feet high and 10 feet in diameter, it is possible to produce approximately 10 tons of hydrogenated product per day.

I desire to call attention to the desirability of securing a very fine division of the oil by the hydrogen in the hydrogenating chamber. By arranging the nozzles very closely together, and blowing the hydrogen through its nozzle at great pressure and high velocity, it is possible so to divide the oil that it is like an almost invisible mist, in which case the oil is, roughly speaking, all surface. Not only does the stream of hydrogen, in impinging upon the oil, break it up, but the expansion of the hydrogen further disrupts the minute particles of oil, so that in effect the oil is practically in a gaseous state, without having been decomposed and without having had latent heat supplied for its gasification. In this state, it is not decomposed by the heat in the chamber, because its passage through the chamber and the diaphragm occupies a small fraction of time, and its reduction and withdrawal are practically instantaneous. This is the optimum condition but of course results may be obtained if the atomization of the oil be not so com-

plete as herein described. It is of course desirable in any case to obtain an intimate mixture of the oil and the hydrogen and in such condition bring them in contact with the catalyzer.

With respect to the catalyzer, it may be pointed out that it is not only not necessary but also undesirable to deposit it in fluffy asbestos or to mix it with or to coat it on such substances as pumice, charcoal or the like. By arranging it in finely divided condition in an unbroken layer or mass, the greatest surface area of the minute particles is exposed for contact with the hydrogen and the oil. But I should not regard it as a departure from my invention should the catalyzer be deposited in asbestos or other equivalent material or mixed with pumice, charcoal or the like, as of course some degree of hydrogenation is secured by such an arrangement. This catalyzing material, either with or without foreign matter such as pumice or the like, is confined in or on what may be termed a filtering diaphragm, in that the latter is composed of material which is pervious to oil and hydrogen, but impervious to the catalyzer, so that when the product is passed through the diaphragm it is free from any catalytic material. In effect, I secure a substantially simultaneous hydrogenation of the oil and filtration of the product, and this operation, so far as the entire apparatus is concerned, is continuous.

As I have previously indicated, a great many changes may be made in the particular forms of apparatus which I have herein illustrated for carrying on my process and the details of construction which I have described may be greatly varied and modified without departing from the spirit and scope of the invention.

What I claim is:

1. A process of hydrogenating oil, which consists in continuously supplying separate streams of oil and hydrogen into contact with a catalyzer and with each other thereby causing the reduction of the oil, revivifying the catalyzer, and withdrawing the hydrogenated product.

2. A process of hydrogenating oil, which consists in atomizing oil with hydrogen, passing said atomized oil and hydrogen into contact with and through a layer of substantially pure finely divided catalyzing material, and withdrawing the hydrogenated product free from admixture with said catalyzing material.

3. A process of hydrogenating oil, which consists in supplying oil and hydrogen to a chamber, mixing the oil and hydrogen, then passing the mixture through a catalyzing material contained within a diaphragm pervious to oil and hydrogen and impervious to said catalyzing material, and withdrawing the hydrogenated product.

4. A process of hydrogenating oil, which consists in continuously supplying oil and hydrogen into a chamber in intimate contact with each other, continuously passing said oil and hydrogen in the same direction through a body of finely divided catalyzer to reduce the oil, and removing the reduced product.

5. A process of hydrogenating oil, which consists in sustaining a layer of finely divided catalyzing material upon a diaphragm impervious to said material but pervious to oil and hydrogen, and continuously passing a mixture of oil and hydrogen in one direction through said catalyzer and said diaphragm to reduce the oil.

6. A process of hydrogenating oil, which consists in forcing a mixture of hydrogen and finely divided oil in one direction through a mass of finely divided catalyzing material and thereby reducing the oil without mixing the catalyzer with the product.

7. A process of hydrogenating oil, which consists in continuously passing a mixture of oil and hydrogen through a catalyzer in one direction to reduce the oil and immediately and continuously passing in the same direction the reduced product through a filter in contact with the catalyzer to prevent the mixing of the catalyzer and the said product.

8. A process of hydrogenating oil, which consists in continuously atomizing oil by a blast of hydrogen, continuously passing the atomized oil and hydrogen through a layer of catalyzing material confined within material impervious to the catalyzing material and impervious to oil and hydrogen to reduce the oil, and withdrawing the hydrogenated product.

9. A process of hydrogenating oil which consists in continuously supplying separate streams of oil and hydrogen, causing said streams to impinge upon each other, and continuously passing the resulting atomized mixture through a layer of substantially pure finely divided catalyzing material confined against admixture with the product.

10. A process of hydrogenating oil which consists in introducing separate streams of hydrogen and oil under pressure into a chamber, causing the stream of hydrogen in excess to impinge upon and atomize the oil in the chamber, forcing the atomized oil and hydrogen under pressure through a catalyzer and thereby hydrogenating the oil, and withdrawing the hydrogenated product and the excess hydrogen from said chamber.

11. A process of hydrogenating oil which consists in introducing separate streams of hydrogen and oil under pressure into a chamber, directing the stream of hydrogen

against the stream of oil and thereby atomizing the oil, forcing the mixture of atomized oil and hydrogen through a mass of finely divided, catalyzing material held in a support impervious to said material and pervious to oil and hydrogen and thereby reducing the oil, and withdrawing the hydrogenated product.

12. The herein described process of hydrogenating oil, which consists in continuously directing a stream of mixed atomized oil and hydrogen in a closed chamber upon a diaphragm containing catalyzing material held between layers of material impervious thereto, forcing by pressure the mixture through said diaphragm and said catalyzing material, and withdrawing the hydrogenated product and excess hydrogen from said chamber.

13. The herein described process of hydrogenating oil, which consists in directing a stream of mixed atomized oil and hydrogen in a closed chamber upon successive portions of the surface of a diaphragm containing a catalyzing material, passing said mixture through said successive portions of said diaphragm into contact with successive portions of the catalyzer, and continuously withdrawing the hydrogenated product.

14. The herein described process of hydrogenating oil, which consists in passing hydrogen and oil in alternation through a catalytic body, first to revivify the said body and then to reduce the oil.

15. The herein described process of hydrogenating oil, which consists in passing hydrogen and a mixture of oil and hydrogen in alternation through portions of a catalytic body, thereby alternately revivifying said catalytic body, and hydrogenating oil in said revivified body, and withdrawing the hydrogenated product.

16. The herein described process of hydrogenating oil, which consists in continuously forcing a body of hydrogen through a catalyzer to revivify it, intermittently forcing a mixture of hydrogen and oil in the same direction through such revivified catalyzer, and withdrawing the hydrogenated product and the excess hydrogen.

17. The herein described process of hydrogenating oil, which consists in continuously forcing a stream of hydrogen through a body of catalyzing material, passing a mixture of atomized oil and hydrogen through successive portions of said material thereby hydrogenating said oil and revivifying the catalyzing material alternately in successive portions of said body of material.

18. The herein described process of hydrogenating oil, which consists in directing a stream of oil, in a closed chamber containing hydrogen under pressure, against successive portions of a filtering diaphragm containing a catalyzer, forcing the oil by the pressure of hydrogen into contact with successive portions of the catalyzer, and removing the hydrogenated product from the other side of said diaphragm.

19. The herein described process of hydrogenating oil, which consists in directing a revolving stream of mixed hydrogen and oil, in an atomized condition, in a closed chamber containing hydrogen under pressure, against successive portions of a filtering diaphragm containing a catalyzer, forcing the mixture by the contained hydrogen through said diaphragm into contact with and past successive portions of the catalyzer into a chamber containing hydrogen under a lower pressure, and removing the hydrogenated product from said last-mentioned chamber.

20. The herein described method which consists in hydrogenating oil in the presence of a mass of catalyzing material, and then in forcing a stream of hydrogen at high velocity through the catalyzer to revivify it.

21. The herein described process of removing films of oil from a catalyzer, which consists in passing a stream of hydrogen through said catalyzer.

22. The herein described process, which consists in circulating hydrogen successively through the first and second compartments of a closed chamber separated by a filtering diaphragm containing a catalyzer, maintaining a predetermined pressure in the second chamber, and a predetermined higher pressure in the first chamber, forming a mixture of oil and hydrogen in the atmosphere of hydrogen in the first chamber, whereby the said mixture is passed through said diaphragm by the circulating hydrogen into contact with the said catalyzer, and the hydrogenated product is forced into the second chamber, and withdrawing the hydrogenated product from said second chamber.

23. The herein described process, which consists in first atomizing a stream of oil by a stream of hydrogen into a substantially invisible mist or vapor without gasification, in a closed chamber, then bringing such mixture into contact with a finely divided catalyzer so confined that oil and hydrogen may pass through without carrying the catalyzer with it, whereby the oil is reduced, and withdrawing the hydrogenated product from said chamber.

24. The herein described process, which consists in heating oil, atomizing a stream of the heated oil in a closed chamber by a stream of hydrogen, bringing said atomized oil and hydrogen into contact with a catalyzer confined between material impervious to the catalyzer and pervious to oil and hydrogen, and removing the hydrogenated product.

25. The herein described process which

consists in reducing oil with hydrogen in the presence of a catalyzer, and substantially simultaneously therewith filtering such hydrogenated product.

26. A process of hydrogenating oil which consists in simultaneously passing oil and hydrogen through a diaphragm pervious thereto and containing a catalyzer to which it is impervious.

27. A process of hydrogenating oil which consists in simultaneously passing hydrogen and finely divided oil continuously in the same direction through a diaphragm pervious thereto and containing a catalyzer to which it is impervious.

28. A process of hydrogenating oil which consists in passing oil and hydrogen through a catalyzing diaphragm, consisting of layers of material pervious thereto and confining between them a catalytic body to which they are impervious.

29. A process of hydrogenating oil which consists in passing hydrogen through a portion of a diaphragm containing a body of finely divided substantially pure catalyzing material, and subsequently passing oil through said portion of the diaphragm in the same direction.

30. The herein described process which consists in forming a layer of a metallic compound between layers of material impervious thereto but pervious to oil and hydrogen, and passing hydrogen through said layers under proper temperature conditions to reduce said compound to a catalytic state.

31. The herein described process which consists in forming a layer of a metallic compound between layers of material impervious thereto but pervious to oil and hydrogen, passing hydrogen through said layers under proper temperature conditions to reduce said compound to a catalytic state, and then passing oil and hydrogen through said layers to reduce the oil.

32. An apparatus for the hydrogenation of oil, comprising a chamber, a filtering diaphragm therein dividing the chamber into two compartments, a body of catalyzing material confined in said diaphragm, means for introducing oil and hydrogen into one of said compartments, and means for securing a greater pressure in the last-mentioned compartment than in the other compartment.

33. An apparatus for the hydrogenation of oil, comprising a chamber, a diaphragm therein dividing said chamber into two compartments, said diaphragm comprising a layer of filtering material and a layer of catalyzing material, and means by which a mixture of oil and hydrogen may be forced through said diaphragm from one compartment into contact with said catalyzing material and into the other compartment.

34. An apparatus for the hydrogenati... of oil, comprising a closed chamber, a di... phragm comprising a body of catalyz... material, and means within said cham... for directing a stream of hydrogen aga... a stream of oil to atomize the latter, ... means by which the atomized oil and hydr... gen are forced through said diaphragm.

35. An apparatus for the hydrogenati... of oil, comprising a closed casing, a perv... layer of catalyzing material therein, fi... ing means for sustaining and confining ... layer, nozzles in said casing for atomiz... a stream of oil by directing a stream of h... drogen thereagainst, and means in con... quence of which the atomized oil and hydr... gen are passed into contact with ... through said catalyzing material.

36. An apparatus for the hydrogenati... of oil, comprising a closed casing, a perv... layer of catalyzing material therein, fi... ing means for sustaining and confining ... layer, nozzles in said casing for atomiz... a stream of oil by directing a stream ... hydrogen thereagainst, means for mov... said nozzles to direct the atomized spray ... ward successive portions of said catalyz... material, and means in consequence ... which the atomized oil and hydrogen ... passed into contact with and through ... catalyzing material.

37. A diaphragm for oil hydrogenati... apparatus, comprising a layer of mate... impervious to a finely divided solid, ... pervious to hydrogen and oil, a layer ... finely divided solid metallic catalyzing ... terial thereon capable of reducing oil ... hydrogen, and means for confining ... last-mentioned layer upon said first-m... tioned layer.

38. A diaphragm for oil hydrogenati... apparatus, comprising a layer of finely ... vided metallic catalyzing material cap... of reducing oil with hydrogen, a supp... ing layer of asbestos impervious to oil ... terial, and a superimposed layer of asb...

39. A diaphragm for oil hydrogenati... apparatus, comprising a layer of finely ... vided metallic catalyzing material cap... of reducing oil with hydrogen, a suppo... layer of asbestos impervious to said ... rial, and one or more layers of porou... material for supporting the previously ... tioned layers.

40. An apparatus for the hydrogena... of oil, comprising a closed casing, a ... ing diaphragm therein comprising a ... of catalyzing material, said diaphrag... viding said casing into two compart... means for atomizing oil in one com... ment and maintaining an atmosphere ... drogen therein at high pressure, and ... for circulating the hydrogen from th... ond compartment back into the first

995

ment and maintaining an atmosphere of rogen in the second compartment at a tively lower pressure.

1. An apparatus for the hydrogenation il, comprising a closed casing, a filtering hragm therein comprising a layer of lyzing material, said diaphragm dividing said casing into two compartments, s for atomizing oil in one compartment and maintaining an atmosphere of rogen therein at high pressure, means circulating the hydrogen from the second compartment back into the first compartment and maintaining an atmosphere ydrogen in the second compartment at atively lower pressure, and means for lying fresh hydrogen to compensate osses due to the reduction of the oil.

42. An apparatus for the hydrogenation of oil, comprising a closed casing having a layer of catalyzing material therein, pipes extending into the chamber formed by said casing for streams of oil and hydrogen respectively, adjacent nozzles on said pipes for directing the stream of hydrogen against the stream of oil to atomize the latter, and means for rotating said nozzles to direct the atomized spray into different portions of the said chamber.

In testimony whereof I have affixed my signature, in presence of two witnesses.

HUGH K. MOORE.

Witnesses:
MARCUS B. MAY,
P. W. PEZZETTI.

n of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

Here follow diagrams marked p. 996, 997 & 998)

Austin Mills 692 9,715
Peerless

BAUMAN MILLS CO. VS. PROCTER & GAMBLE CO.

H. K. MOORE.

METHOD AND MEANS FOR HYDROGENATING UNSATURATED COMPOUNDS.

APPLICATION FILED OCT. 31, 1914.

1,184,480.

Patented May 23, 19

3 SHEETS—SHEET 1

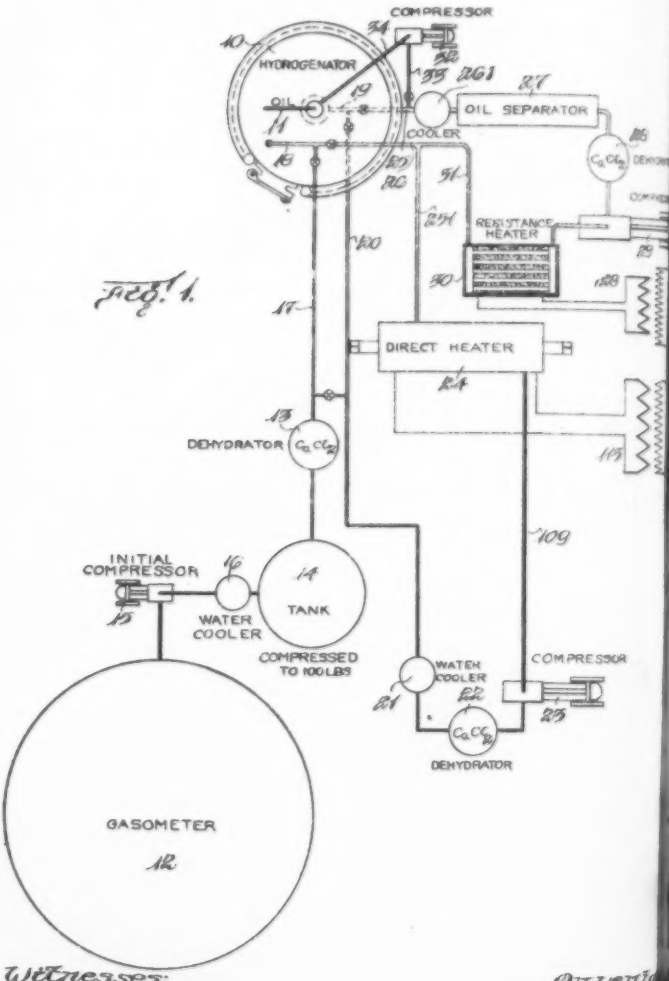

Fig. 1.

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1,184,480. Patented May 23, 1916.

3 SHEETS—SHEET 2

Fig. 2.

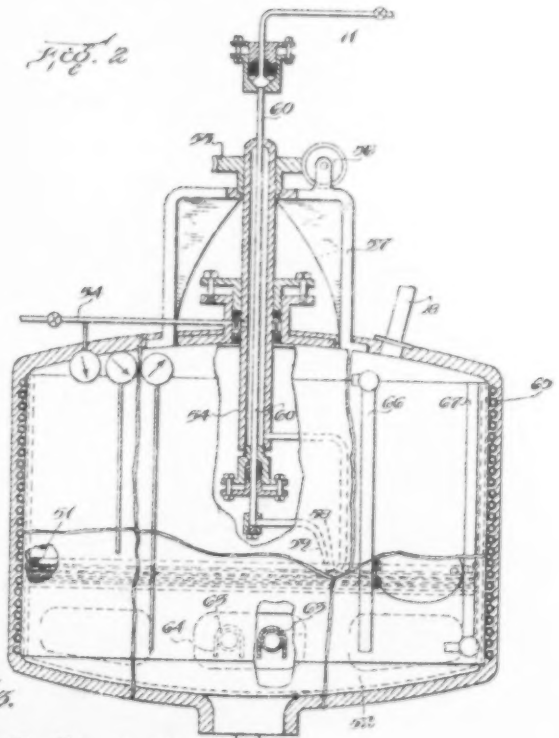
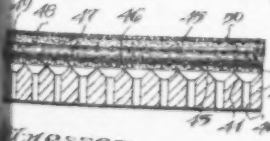


Fig. 3.



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Berlin Mills v Ohio

998

BERLIN MILLS CO. VS. PROCTER & GAMBLE CO.

H. K. MOORE.

METHOD AND MEANS FOR HYDROGENATING UNSATURATED COMPOUNDS.

APPLICATION FILED OCT. 31, 1914.

1,184,480.

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3 SHEETS—SHEET 1.

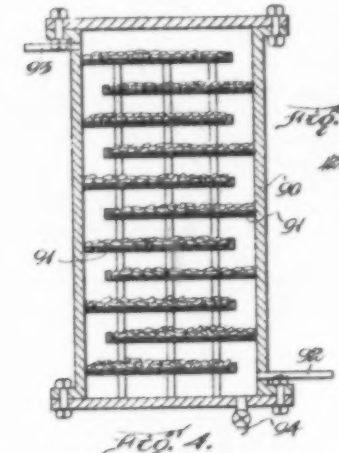

Fig. 4.

Fig. 8.

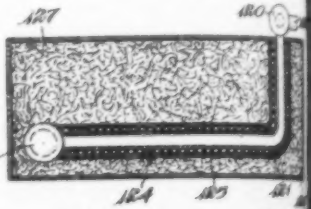

Fig. 6.

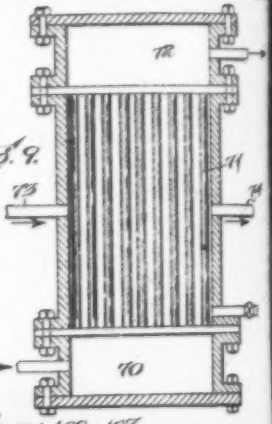

Fig. 9.

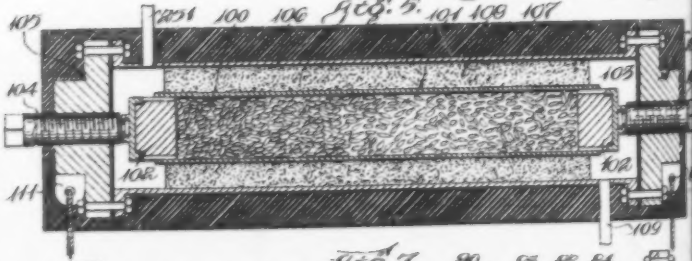

Fig. 5.

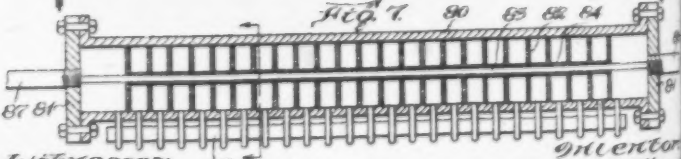

Fig. 7.

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999

UNITED STATES PATENT OFFICE.

HUGH K. MOORE, OF BERLIN, NEW HAMPSHIRE.

METHOD AND MEANS FOR HYDROGENATING UNSATURATED COMPOUNDS.

1,184,480. Specification of Letters Patent. Patented May 23, 1916.

Application filed October 31, 1914. Serial No. 869,689.

all whom it may concern:

Be it known that I, HUGH K. MOORE, a zen of the United States, and a resident Berlin, in the county of Coos and State New Hampshire, have invented certain w and useful Improvements in Methods d Means for Hydrogenating Unsaturated mpounds, of which the following is a ecification.

This invention has relation to the hydro- nation of oils or fats, or other like un- turated compounds such as the esters or cerids of the fatty acids, the fatty acids, , and it has for its object to provide cer- in improvements, not only in the process hydrogenating unsaturated compounds, t also in certain of the instrumentalities ich may be conveniently used in connec- n therewith, so that the process may be rried on commercially in an economical nner and the product placed upon the rket at a reasonable cost of production. In general, the process, in its more es- ntial features, is set forth in my applica- n Serial No. 821,241, filed February 26, 4, to which reference may be had for general description thereof.

According to the process outlined in the d application, unsaturated compound hich for convenience I hereinafter term il") is atomized by a blast of hydrogen d is caused to pass through a layer of ely divided catalytic material, preferably d upon a diaphragm which is pervious the hydrogen and oil but impervious to catalyzing material, the result of which hat the oil is hydrogenated and the prod- is removed without carrying with it any the catalytic material.

One of the objects of the present inven- is to insure the purity of the resultant duct by preventing any deposit of car- aceous material in the diaphragm or alyzer such as would tend to discolor the ultant product.

Another object of the invention is to pro- e for supplying the hydrogen at a pre- termined temperature, free of water or er foreign substance, irrespective of ether the hydrogen be that which was viously used in excess in the hydrogena- n of the compound, or in the reduction the catalyst, or whether it be drawn from original source of supply.

Still another object of the invention is to vide instrumentalities for accomplish- ing these desirable results, and to provide certain improvements in the instrumental- ities themselves.

A further object of the invention is to provide a body of catalyzing material of a finely divided nature in such form that it will not crack or contract and permit the oil and hydrogen to pass through without coming into intimate contact with the cata- lytic material.

The invention has further for its object to provide other improvements which are illustrated upon the accompanying draw- ings, described in the following specifica- tion and pointed out in the appended claims.

Referring to the accompanying draw- ings,—Figure 1 represents in plan view diagrammatically instrumentalities which may be utilized in carrying out my im- proved process. Fig. 2 represents partially in section what I may term the hydrogena- tor; that is, the instrumentality in which the saturation of the compound is effected. Fig. 3 represents an enlarged more or less conventional view of a section of the layer of catalytic material and the diaphragm. Fig. 4 represents in section a drier which is utilized in abstracting any moisture that may be therein contained. Fig. 5 illustrates a longitudinal section through the heater which is utilized for supplying to the hy- drogenator the hydrogen which is employed in reducing the material to its active cata- lytic condition for use as a catalyzer. Fig. 6 represents a form of heater, which I find convenient for heating the hydrogen which is being re-used in the hydrogenation of the oil. Fig. 7 illustrates a longitudinal section through a separator which is employed for abstracting from the hydrogen, which has passed through the hydrogenator, any en- trained oil. Fig. 8 represents a transverse section therethrough. Fig. 9 represents a section through one of the coolers which is employed for condensing moisture out of the hydrogen.

Before proceeding to describe one way in which the process may be carried out and the instrumentalities which I have illus- trated as being capable of convenient em- ployment in connection with the process, I desire to have it understood that the in- vention is not limited to the particular process or the particular steps which I shall describe, nor to the employment of the par-

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ticular form of apparatus. I have not attempted to illustrate the exact relative sizes of the various instrumentalities or their exact locations in carrying out the process, since Fig. 1 of the drawings is in the nature of a diagrammatic view in which the parts are located on the sheet of drawings where they can be seen to the best advantage. In point of actual practice, the various instrumentalities are located relatively close together and at different elevations so as to obviate the necessity of using long conduits for the hydrogen and to secure a compactness of arrangement.

Referring now to Fig. 1 for a general description of a way in which the process may be practised,—10 indicates what I term for convenience a "hydrogenator" in which the oil or other compound is reduced by hydrogen in the presence of a catalyzer. This apparatus will be described subsequently more in detail. The oil, or other compound, which is admitted to this apparatus, is drawn from any suitable source and is supplied therefrom by a conduit 11. The hydrogen which may be obtained in any suitable way, as for instance, by the electrolytic decomposition of sodium chlorid and water, may be stored in a gasometer 12, from which it is drawn as needed. The first step which is essential before the actual hydrogenation of the oil, is the reduction of the material to be used as a catalyzer. This necessitates the supplying of the hydrogen at a relatively high temperature and in a condition in which it is free from moisture, oil and other impurities. To this end, I locate between the hydrogenator and the gasometer, which I may for convenience term the source of supply, means for depriving the hydrogen of any entrained or dissolved moisture or other impurities. 13 indicates such means, which I may term the dehydrator, and which is supplied with any suitable hygroscopic material for absorbing the moisture. This is preferably located between the hydrogenator 10 and the tank 14, into which the hydrogen is pumped by a compressor 15 from the gasometer 12. Between the compressor and the storage tank is preferably placed a cooler and condenser 16. In the storage tank 14, the hydrogen may be held at a pressure of approximately 100 pounds to the square inch. From the dehydrator the gas is supplied to the hydrogenator 10 by a conduit 17, connected to a pipe 18 which leads into the top of the hydrogenator. From the lower portion of the hydrogenator the hydrogen is led by conduits 19 and 20 to a cooler 21, and thence through a dehydrator 22 to a compressor 23, and thence to a heater 24 by which the hydrogen is heated to the desired temperature. From the latter, it is conducted by a conduit 251 to conduit 26 connected to that at 18. This much of the apparatus is utilized for the reduction of the nickel oxid or other material which is used as a catalyzer. After the desired quantity of hydrogen is admitted to the upper chamber of the hydrogenator and has passed through the catalyzing material, it is heated by the heater 24 to the desired temperature and circulated again through the layer of oxid at the necessary temperature for the reduction thereof. The reduction takes place at approximately a temperature of 570° F. and hence the gas is preferably heated to a temperature between 600° F. and 650° F. or higher, if desired, to compensate for loss by radiation or otherwise.

After the material, which forms the catalyzer, has been properly reduced to active condition, the oil is supplied and is atomized by a blast of hydrogen and is caused to pass with the hydrogen through the catalytic material. The gas is supplied to the hydrogenator greatly in excess of that needed for the reduction of the oil and is circulated therethrough. As pointed out in the application to which reference has already been made, and as will be subsequently described, there is in the hydrogenator preferably a diaphragm in which the catalytic material is contained, this diaphragm serving to divide the hydrogenator into two chambers, one above, and the other below the diaphragm. A suitable difference in pressure is maintained in these two chambers so that the hydrogen will be forced at high velocity through the catalytic material in the diaphragm into the lower chamber. The hydrogen, which is delivered from the lower compartment through the conduit 19, is, when the reduction of the oil is proceeding, delivered to a conduit 26 connected to that at 19. This gas, if desired, is passed through a cooler 261 like that at 16, where it is cooled sufficiently to condense the vapors and to permit the separation of the resulting entrained oil in an oil separator which is indicated at 27. The gas, which is thus freed from the oil, is delivered to the dehydrator or drier 28 which removes any remaining moisture and any entrained oil, if there be any. From the dehydrator or drier the hydrogen is pumped by a compressor 29 (preferably driven by a variable speed motor, not shown) through a heater indicated as a whole at 30, and thence it passes through a conduit 31 to the conduit 26 by which it is again delivered to the hydrogenating apparatus.

For the atomization of the oil, it is necessary that it be sprayed into the hydrogenating apparatus by gas under a higher pressure than that which is in the upper compartment of the hydrogenator; and hence, for this purpose, I utilize a relatively small compressor 32 which as shown in

draw gas from the main outlet 25 through a conduit 33 and delivers it through a conduit 34 to the nozzle. The volume of gas passed through this compressor is relatively small as compared with that which passes through the main compressor 29, and, since this gas is passed back into the hydrogenating apparatus with but little loss of heat, I do not find it practically necessary to use a heater and consequently there is no necessity for the employment of an oil separator or drier or cooler. If desired, the intake of the compressor might be connected with the pipe 26 instead of the pipe 25 to reduce the work of the compressor 32.

These various instrumentalities, which I have referred to thus briefly, are more especially desirable for use in connection with the hydrogenation of oil for edible purposes where the discoloration of the product is highly objectionable.

I shall now proceed to describe in detail the various instrumentalities to which I have briefly referred, but in so doing, as I have already pointed out, I desire it to be understood that the invention is not limited to the use of such particular instrumentalities, although I find them to be desirable for accomplishing the purposes for which they are utilized. I have not complicated the drawings by showing all of the various valves and pipes and fittings that may be used to control the flow of oil and hydrogen, but it will be understood that they are used wherever necessary.

I will first describe the hydrogenating apparatus. This is indicated as a whole at 39, and, as illustrated comprises a large shell or casing, across which is placed a grid 40 consisting of a plate provided with numerous rows of perforations. The upper surface of the plate is preferably provided with intersecting V-shaped grooves 41, the bottoms of which communicate with the perforations 42. Thus the upper surface of the grid is provided with a series of rows of projections 43 of pyramidal form. This grid is utilized for supporting the diaphragm, and upon it is placed a sheet of heavy steel wire cloth 44 which is preferably rolled to flatten the exposed surfaces of the wires. The rolling of the cloth prior to using stiffens it and securely interlocks the wires together. Upon the wire cloth 44 is placed a second cloth 45 formed of much finer wire and with much smaller mesh. These three elements, to wit, the perforated grid and the two layers of wire cloth, constitute a support for the diaphragm, and the construction and arrangement is such that the diaphragm is supported at very many adjacent points where it comes in contact with the layer of fine wire cloth so as to prevent its yielding or breaking. Upon the cloth 45 is placed a sheet 46 of asbestos paper or its equivalent which is pervious to oil and hydrogen but impervious to the catalytic material. This catalytic material is in a finely divided state and may be formed from any of the usual metals such as palladium, platinum, nickel, etc. Assuming that the nickel is to be used as a catalyzer, the oxid in a finely divided condition may be thoroughly mixed with long or stringy asbestos fiber, and a layer thereof is placed upon the sheet 46, as indicated at 47. A second sheet 48 of asbestos may be then placed upon the layer and a second layer of asbestos fiber and nickel oxid laid thereon as indicated at 49. To hold the layers in place, there is located above them a sheet 50 of fine wire cloth. If desired, a sheet of asbestos, not shown, may be interposed between the top layer of catalytic material and the wire gauze 50. The margins of the asbestos 48 and the wire gauze 50 may be turned upwardly, as shown in Fig. 2, and clamped against the inner wall of the casing by a metallic ring 51, the expansion of which is preferably a little greater than that of the casing so as to prevent the formation of cracks between the diaphragm and the wall of the casing. The grid and the diaphragm are supported upon hollow cross bars placed in the lower portion of the casing, as indicated in dotted lines at 52, to divide the casing into two compartments.

I have stated that the layer of catalytic material contains in mixture therewith long fibered asbestos. This is merely a mechanical mixture, the asbestos being utilized to prevent the layer of catalytic material from cracking, very much as hair has been used in plaster for the same purpose. Only a very small quantity of the fibered asbestos is necessary for this purpose. After the diaphragm is formed, with nickel oxid, for instance, for providing the active material, the hydrogen at a high temperature is passed therethrough to reduce it to its active condition. The hydrogen from the pipe 34 is delivered to the rotary pipe 54 which extends down into the casing and which is driven by a worm wheel 55 and worm 56 supported upon a frame 57. The pipe 54 is provided with a nozzle 58 for directing the blast of hydrogen against the oil which is delivered from the nozzle 59, the latter being connected to a pipe 60, to which is coupled the pipe 11 leading from the source of oil supply. The two nozzles 58 and 59 are in close proximity, so that, as the oil issues from the nozzle 59, it is blown across a portion of the upper surface of the diaphragm. The finely divided oil and hydrogen pass through the layer of catalytic material and the oil is saturated or reduced by the hydrogen. As the nozzles revolve, the spray is directed toward successive portions of the diaphragm, the excess hydrogen passing

through the remaining portions and revivifying the catalyzing material. As considerable hydrogen in excess is required, it is supplied to the casing through the conduit 18. The hydrogenated product is continuously removed from the lower portion of the casing by the eduction pipe 62. The unused hydrogen, which passes through the diaphragm, is carried out through pipes 63 of which there may be as many as desired, these pipes being connected to the pipe 19 in Fig. 1. Said pipes are arranged above the bottom of the casing below the diaphragm and are provided on the under portions of their peripheries with numerous holes or perforations leading to the interior thereof for the entrance of the gas. For the protection of the pipes from the hydrogenated product, aprons or shields 64, which are substantially U-shaped in cross-section, are placed upon the pipes as shown, so that the hydrogenated product dripping down will not be entrained to any considerable extent in the outflowing gas. For the purpose of maintaining the temperature within the casing at the proper point, the casing may be encircled by a series of pipes 65 connected to the manifolds 66, 67, superheated or high pressure steam being supplied to the former and conducted away from the latter by suitable conduits. These pipes, as well as the entire exterior of the casing, are completely covered by one or more layers of insulating material such as magnesia or other suitable substance to prevent the loss of heat by radiation. The pressure of the atmosphere of hydrogen above the diaphragm is maintained at a point considerably higher than the pressure of the atmosphere below the diaphragm to insure the passage of the hydrogen through the diaphragm at a high velocity, and the hydrogen which is blown in through the nozzle 58 is at a still higher pressure in order to form the atomized blast.

One of the difficulties that I have met with practically in the operation of an apparatus of this character having a diaphragm of large area has been due to the occasional cracking of the catalytic layer and also due to the expansion of the casing which forms cracks or spaces at the outer edges of the diaphragm, through all of which cracks and spaces the hydrogen escapes into the lower compartment, thereby permitting some of the oil to pass through without being reduced, and so reducing the pressure above the diaphragm that the gas will pass therethrough in only limited quantities. I have overcome this difficulty by incorporating with the layer of catalytic material long-fibered asbestos, as hereinbefore explained, which I find prevents the formation of cracks. The difficulty, due to the expansion of the casing, has been overcome by the provision of the ring 51 which clamps the margins of the portions of the diaphragm against the outer sheil. This ring expands coincidently with the shell so as to keep the edges of the diaphragm thereagainst said ring permitting a slipping of the edges of the diaphragm past it as the ring expands without causing a tearing or breaking of the diaphragm. In actual practice, the material may be covered over by a layer of the catalyzing material at the outer edge of the diaphragm. Due to the pressure upon the diaphragm, it is necessary that it should be rigidly supported and yet that it should be supported in such way as not to obstruct the flow of the gas and the hydrogenated product through it. I accomplish this by a grooved and perforated grid which may be made of such thickness as to withstand the pressure, and by the use of one or more layers of wire cloth placed thereon. Practically I employ two layers, the lower one of heavy wire cloth and the upper one of a finer mesh in order that the asbestos may not be forced into the meshes.

Cooler and condenser.—Any suitable apparatus for removing moisture from the gas, as during the reduction of the catalyst may be utilized, but I have shown in Fig. 1 an apparatus which I utilize at either 260 or 261 in Fig. 1. This apparatus may consist of an ordinary condenser. Water is admitted to the lower chamber 70, and, passing through the tubes 71 into the upper chamber 72, is conducted away. The gas is admitted to the space between the tubes by the pipe 73 and is conducted therefrom by the pipe 74. As the cooling medium I may use ordinary river water at seasonable temperature. In the case of the cooler 16, in Fig. 1, the greater part of the moisture contained in the gas is condensed and removed. In the case of the cooler 260, however, not only is a portion of the entrained moisture (if there be any) removed but also a large portion of the oil which is dissolved in the gas is condensed and removed therefrom or put in the condition for entrainment, so that it may be subsequently removed by the oil separator. In the case of the condenser shown, however, any other suitable form may be employed.

Oil separator.—For the purpose of removing from the hydrogen that has passed through the hydrogenating apparatus the oil, which has been placed in condition for entrainment, I employ an oil separator. Reference to this end I may use an apparatus such as shown in Figs. 7 and 8. This separator consists of an elongated cylinder 80 having heads 81, 81, secured on the ends thereof. Within the cylinder is placed a number of disks 82 which are strung upon a rod 83 and spaced apart by sleeves 84. These disks are provided with numerous perforations, the perforations of each disk being out of

1003

ment with the perforations of the two adjacent disks. Leading from the space between each pair of disks, there is a trapped outlet pipe 85 communicating with a manifold 86. The gas and its entrained oil is admitted at one end through the pipe 87, and the gas freed from the oil is admitted through a pipe 88 at the other end.

As the gas with the entrained oil passes at high velocity through the separator, the oil comes in contact with the plates and forms globules thereon which gradually run down and are carried away through the pipes 85 to the manifold 86. I have shown this form of separator which I have found to be satisfactory for the purpose, but any other suitable form may be utilized in lieu thereof.

The dehydrator.—It is of great importance, not only in the hydrogenation of the oil but also in the reduction of the catalytic material, completely to remove, so far as possible, all moisture from the hydrogen, or, if the moisture remains in the gas, it will be broken up in the heater and the free oxygen and other oxygen compounds will injure the catalyzing material. Consequently I employ what I term a dehydrator, such as shown in Fig. 4. This may consist of a closed casing 90 provided with staggered shelves 91, upon which is placed a quantity of dehydrating or hygroscopic material such as fused calcium chlorid or the like. The gas is admitted to the lower portion of the casing through a pipe 92, and following a tortuous path upwardly passes over and in contact with the dehydrating material and is finally emitted from the pipe 93. I preferably form the shelves 91 with numerous small apertures through which the gas may pass upwardly through the layers of dehydrating material thereon, and inasmuch as the dehydrating materials are usually deliquescent, the perforations in the shelves permit the resulting liquid gradually to flow down so as to be discharged through the valved drain pipe 94. By fusing off the water, the dehydrating material can be reused. In the commercial practice of my process, I have found an apparatus such as just described to be satisfactory, but any other suitable form of dehydrating apparatus may be utilized in lieu thereof. I preferably employ fused calcium chlorid for the reason that it has an affinity for oil as well as for water, and, if any oil escapes from the separator, it is taken up and removed in the dehydrator.

The heaters.—In the reduction of the catalytic material, it is necessary that the gas should be heated to a relatively high heat; whereas, for the reduction of the oil, the gas need not be heated to such a high temperature, although the temperature will be regulated according to the product to be obtained, say from 175° F. to 480° F., as I have already explained; and I therefore preferably employ two forms of heater, each especially designed for its particular purpose. In raising the gas to its highest temperature for the reduction of the catalyzer, which operation takes but a relatively short time, say from 3 to 6 hours, and in which there is little or no possibility of oil having been entrained with the gas due to the gas having been drawn from its original source of supply, I find it possible to use the heat generated by electrically resistant materials with which the gas may come directly in contact, thus enabling the gas to be quickly raised to any desired high temperature. It is necessary that such resistant materials be employed as will not be acted on by the hydrogen at the high temperatures to which it is raised. It is possible to utilize for this purpose pieces of carbon such as the carbon pencils used in arc lamps. These pencils are broken up into relatively short lengths and the entire mass is confined within a suitable holder. An electric current of high amperage and low voltage is passed through them coincidently with the passage of the hydrogen through the interstices of the mass. In Fig. 5 of the drawing, I have illustrated a heater in which the mass of carbon rods 100 is confined within a tube 101 formed of fire clay, magnesia or equivalent material. Into each end of the tube there is inserted a block 102 of Atcheson graphite, the periphery of which is grooved or slabbed off so as to permit the passage of gas thereby, while holding the resistant material in place. The blocks 102 are held in place by metallic holders 103, against which bear the ends of screws 104. These screws are passed through cylinder heads 105 insulated from but bolted to a cylinder 106. The cylinder and the heads may be formed of metal. The shell or casing thus formed is completely inclosed within a covering 107 of heat-insulating material. Between the tube 101 and the cylinder 106 is placed a mass 108 of heat-resistant material, such as powdered fire brick or the like, which is sintered together to form a solid mass after it is put in place. The gas to be heated is admitted through a pipe 109 into the space between the filler 108 and one of the cylinder heads, and is conducted from the heater by a pipe 251 leading to the pipe 26. Connected to the heads 105 are terminals 111 of conductors leading from a secondary coil of a transformer indicated at 113 in Fig. 1. A transformer of suitable character is employed for the purpose of delivering a current of high amperage and low voltage; for instance, a current of 2400 amperes at a maximum potential of approximately 50 to 55 volts. The current, in passing from one of the blocks 102 to the other through the mass of resistant ma

terial, heats the latter at their multitudinous points of impingement to a high temperature, so that the gas, in passing through the mass, is heated to a temperature necessary for the reduction of a catalytic material. I use a current of low voltage and high amperage in order to prevent the formation of arcs such as would cause the hydrogen to react with the carbon, with the formation of acetylene, while at the same time the resistant material is heated to a high temperature. The gas possesses low powers of conductivity, but, by being passed through the interstices formed between the carbon rods which are packed together, is heated with but little loss of heat. It is possible to control the temperature of the gas in either of two ways; first, by varying the flow of the gas through the heater, and, secondly, by increasing or decreasing the resistance in the circuit. The resistance may be varied by the adjustment of the screws 104. By packing the resistance material more closely together, a greater flow of current is permitted with a consequent rise in temperature of the resistant material; whereas, by partially unscrewing the screws so as to reduce the pressure of the pieces of resistant material upon each other, the resistance to the passage of the current will be increased, and the heat generated will be correspondingly diminished. This heater, as previously explained, is preferably used only for raising the temperature of the gas which is utilized for the reduction of the catalyzing material, where there is no possibility of oil passing through with the gas.

For heating the hydrogen, which has already been used in the hydrogenator, to a relatively lower temperature which is necessary for the reduction of the oil, I may employ a heater such as shown in Fig. 6, in which case the gas is heated by conduction as it is passed through a series of pipes by heating the pipes themselves. In Fig. 6, I have shown such a heater, which consists of a manifold 120 to which the gas is supplied from the pipe 121. From the manifold 120 a series of pipes 122 lead to a manifold 123 connected with the pipe 31, see Fig. 1. Around each pipe 121 there is one or more resistance coils 124 inclosed within a layer 125 of insulating material. These pipes and the manifold 123 are located within a casing 126 containing a packing of non-conducting material 127. I may use for this purpose magnesium and asbestos fiber or any other equivalent substance. The resistance coils are connected with the secondary of a transformer 128 so constructed as to provide a potential of 110 volts, which is the ordinary lighting circuit. The gas, in passing through the pipes from one manifold to the other, is heated to the desired temperature. Any suitable form of regulating device for the resistance coils may be utilized to regulate the temperature of the gas. It is possible to use in lieu of an electric heater a steam heater, although I prefer the electric heater as it prevents any possibility of the access of steam to the gas by leakage.

I have found the heaters which I have described to be satisfactory, but it will be understood that other forms of heating apparatus for the hydrogen may be utilized in lieu thereof.

I have thus described in detail the various instrumentalities which I recommend for carrying out my process in order that persons skilled in the art may have the advantage of the knowledge I have gained in the hydrogenation of unsaturated compounds and in order that users of the process may be guided in the selection or construction of apparatus suitable for the purpose.

In my previous application I have pointed out the desirability of securing a fine division of the oil prior to its reduction by hydrogen, and I also explained a theory I have formed of the reaction that takes place during the reduction of the unsaturated compound. Later developments have led me to believe that the catalytic material does not form the simple hydrid which I suggested as an example in the specification of my application. While these later developments have served to confirm my belief that unstable hydrids are formed, yet I am now inclined to the opinion that these hydrids are more complex, such as would be represented by the formula Ni_3OH_n, where n may indicate a variation within considerable limits. Quite irrespective of my theory, however, it is unquestionably the fact that by my process, unsaturated compounds may be commercially reduced by a continuous process and to the desired point of saturation, and the catalyzer may be revivified when the same becomes sluggish or inactive by passing the hydrogen therethrough.

So far as my work has gone, I have been unable to determine the limits of indestructibility of a given quantity of the catalyst when revivified from time to time as directed in my earlier application. While the asbestos layers of the diaphragm occasionally require renewal, due to their becoming plugged by albuminous matter, yet I have discovered no deterioration of the catalytic material itself. In this connection I may refer to the fact that I have herein suggested the employment of a compressor driven at variable speeds, so that, should the asbestos portion of the diaphragm gradually becomes increasingly resistant to the passage of the hydrogen and the reaction product therethrough (on account of the accumulation of albuminoids or other substances), the pressure and volume or weight of gas delivered from the compressor

1005

correspondingly varied. In explanation ere is a physical and chemical law which y be stated roughly as follows:—In a aseous reaction tending to reduce the num- r of molecules present, the reaction is di- ctly proportional to the pressure. In the esent case, notwithstanding the oil or her compound may be a liquid, I believe e reaction to be gaseous, in view of the e atomization of the compound. Hence, the hydrogenation, I maintain the hydro- n under high pressure. As the diaphragm gs, which would naturally cause a dual increase in the pressure above the phragm (assuming the delivery of the drogen from the compressor to be at a stant pressure and volume), it is desir- e to reduce the weight of hydrogen be- delivered from the compressor, so as to intain the hydrogen above the diaphragm the working pressure which has been nd desirable to secure a uniformity of duct, and hence the compressor is driven lower speed.

Having thus described a way of practis- my invention and forms of apparatus ch may be employed therewith, without empting to set forth all the ways in which d invention may be practised or all the ms of apparatus useful therewith, what laim is:

The herein described process which sists in circulating hydrogen in excess contact with oil through a diaphragm taining a catalyzer to reduce the oil, and ing the unused excess hydrogen for the densation and removal of contained or.

The herein described process which sists in circulating hydrogen in excess contact with oil through a catalyzer ained in a diaphragm pervious to the nd gas but impervious to the catalyzer educe the oil, condensing the vapors con- ed in the excess unused hydrogen, and rating from such hydrogen the en- ed moisture and oil.

The herein described process of hy- enating oil which consists in passing rogen and oil under pressure through a ytic diaphragm pervious to oil and hy- en and impervious to the catalytic ma- l, and decreasing the weight of the hy- en being fed as the resistance to the ge of the hydrogen therethrough in- es, so as to preserve a uniformity of ure on the diaphragm.

The herein described process which sts in circulating hydrogen in excess contact with oil and a catalyst to reduce il, condensing and removing moisture entrained oil from the unused excess ogen, heating said hydrogen, and reus- ch hydrogen for the reduction of more

5. The herein described process which consists in circulating hydrogen in excess into contact with oil and a catalyst to reduce the oil, cooling the unused hydrogen to condense vapors, removing moisture and entrained oil from such cooled hydrogen, then heating the hydrogen and then reusing the same for the reduction of more oil.

6. The herein described process which consists in circulating a volume of hydrogen through a mass of catalytic material, atomizing a stream of oil by a separate stream of hydrogen and passing the atomized oil through the catalytic material.

7. The herein described process which consists in atomizing a stream of oil by a stream of hydrogen on one side of a pervious diaphragm containing a catalyzer, supplying an additional stream of hydrogen on the same side of said diaphragm, and passing the atomized oil and excess hydrogen through said diaphragm into contact with said catalyzer, and withdrawing the hydrogenated product.

8. The combination with a hydrogenating apparatus, and a support therein for a body of catalytic material, of means for circulating gas through said apparatus and catalytic body for the reduction of the catalyst, including a cooler for condensing the contained moisture in the gas, means for dehydrating said gas, a compressor, and a heater for the gas.

9. The combination of a hydrogenating chamber, means therein for supporting a layer of catalytic material, means for purifying, heating and circulating gas through said hydrogenating chamber and catalytic material to reduce such material, and separate means for purifying, heating and circulating gas in excess through said chamber and catalytic material for the hydrogenation of an unsaturated compound.

10. The combination with a hydrogenating apparatus comprising an atomizer for hydrogen and oil, and an independent inlet for hydrogen, of means including a pump for forcing hydrogen discharged from said apparatus through said atomizer, and means connected with said inlet for circulating hydrogen through said apparatus, including a pump, means for depriving the hydrogen of contained vapor and oil, and a heater for the hydrogen.

11. The combination with a hydrogenating apparatus of means for circulating excess hydrogen therethrough comprising a condenser, an oil separator, a dehydrator, a compressor, a heater, and conduits connecting the same so that the hydrogen passes through the same in the order named.

12. The combination with a hydrogenating apparatus having oil and hydrogen nozzles for atomizing the oil, of a compressor for forcing hydrogen through its appro-

priate nozzle, and a compressor for forcing hydrogen in excess into said hydrogenator.

13. The combination with a casing having a layer of catalyzing material therein, and nozzles therein for atomizing oil by a blast of hydrogen, of a compressor for delivering hydrogen under high pressure to the atomizer nozzle, and a compressor for delivering excess hydrogen under lower pressure to said casing.

14. A diaphragm for oil-hydrogenating apparatus, comprising a layer of material impervious to a finely divided solid but pervious to hydrogen and oil, and a layer thereon consisting of a catalyst capable of reducing oil with hydrogen and having mechanically mixed therewith or incorporated therein a fibrous material for preventing the formation of cracks.

15. The combination with a casing, of a grid therein, said grid being provided with apertures, and with intervening projections on its upper surface, a layer of coarse wire cloth resting on said projections, a superposed layer of fine wire cloth, and a catalytic diaphragm resting thereon.

16. The combination of a casing, a diaphragm therein provided with catalytic material, means for supplying oil and gas to the interior of the casing above the diaphragm, an outlet below the diaphragm for the hydrogenized product, and a transverse eduction pipe for the hydrogen below the diaphragm, having openings in its under portion.

17. The combination of a casing, a diaphragm therein provided with catalytic material, means for supplying oil and gas to the interior of the casing above the diaphragm, an outlet below the diaphragm for the hydrogenized product, a transverse eduction pipe for the hydrogen below the diaphragm, having openings in its under portion, and a shield or apron on said pipe, substantially for the purpose described.

18. The combination with a casing, of a diaphragm therein containing a catalyst capable of reducing oil with hydrogen, and an expansible ring clamping the margin of the diaphragm against the inner wall of the casing.

19. The combination with an apparatus for the hydrogenation of oil, of a heater, a dehydrator having hydroscopic material and means for forcing hydrogen first through said dehydrator and then through said heater to said apparatus.

In testimony whereof I have affixed my signature, in presence of two witnesses.

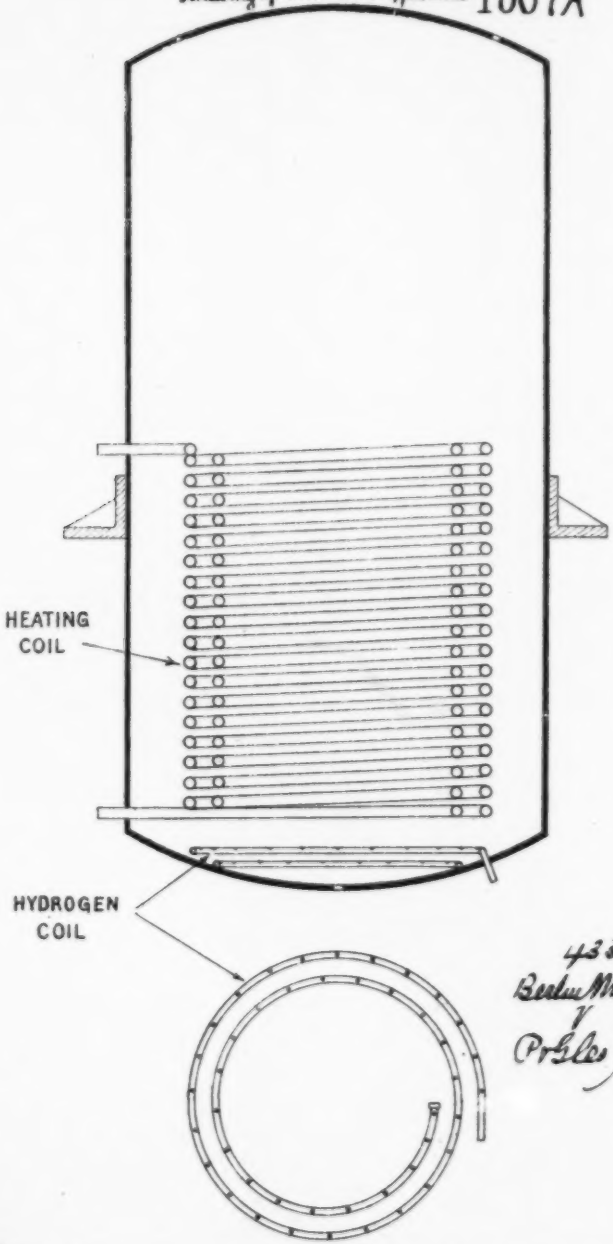
HUGH K. MOORE.

Witnesses:
MARCUS B. MAY,
P. W. PEZZETTI.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

Here follow diagram, marked Fig. 1007 to 1013 inclusive.

Defendant's Exhibit Y
Drawing of Fort Worth Apparatus 1007A



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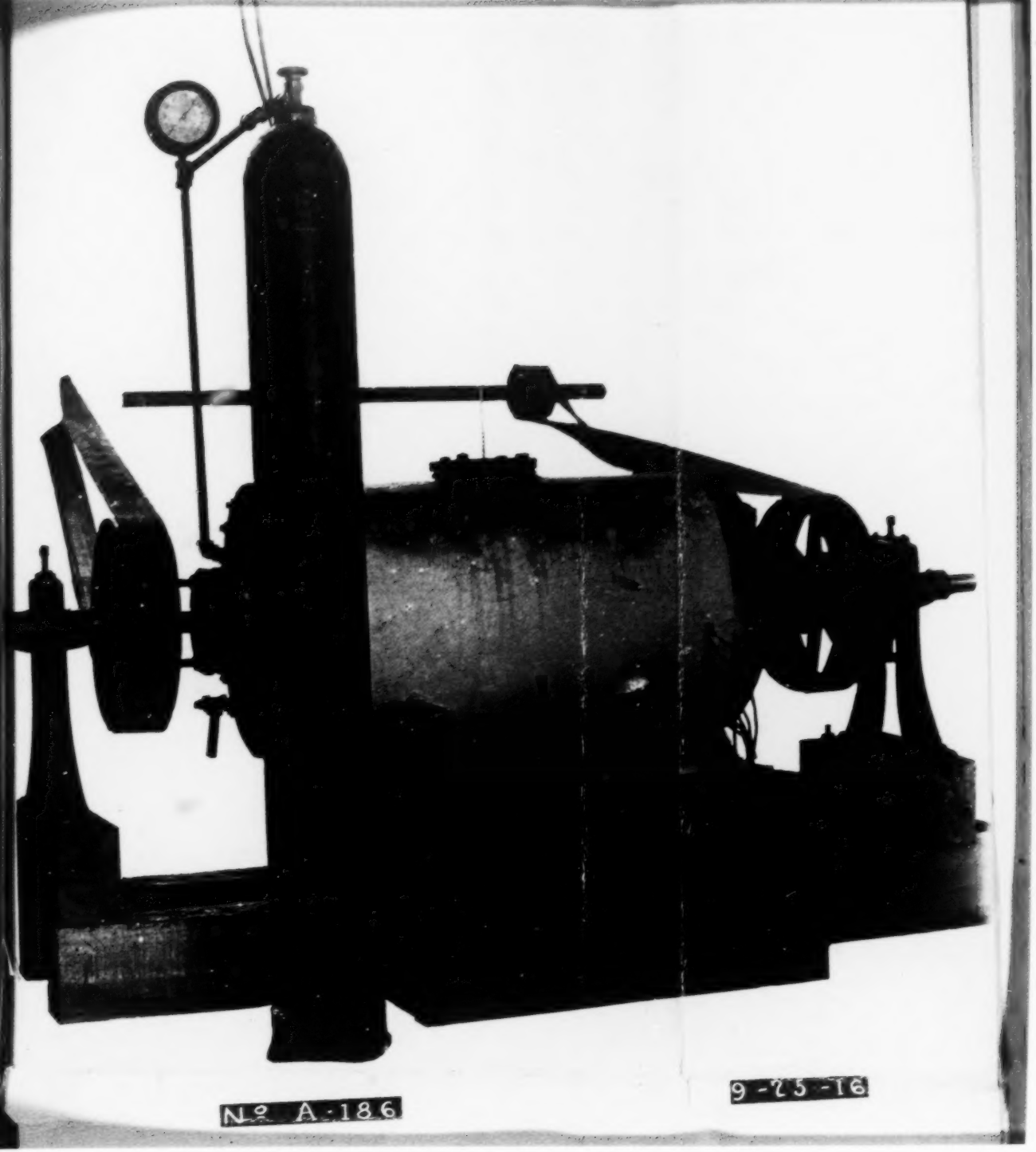

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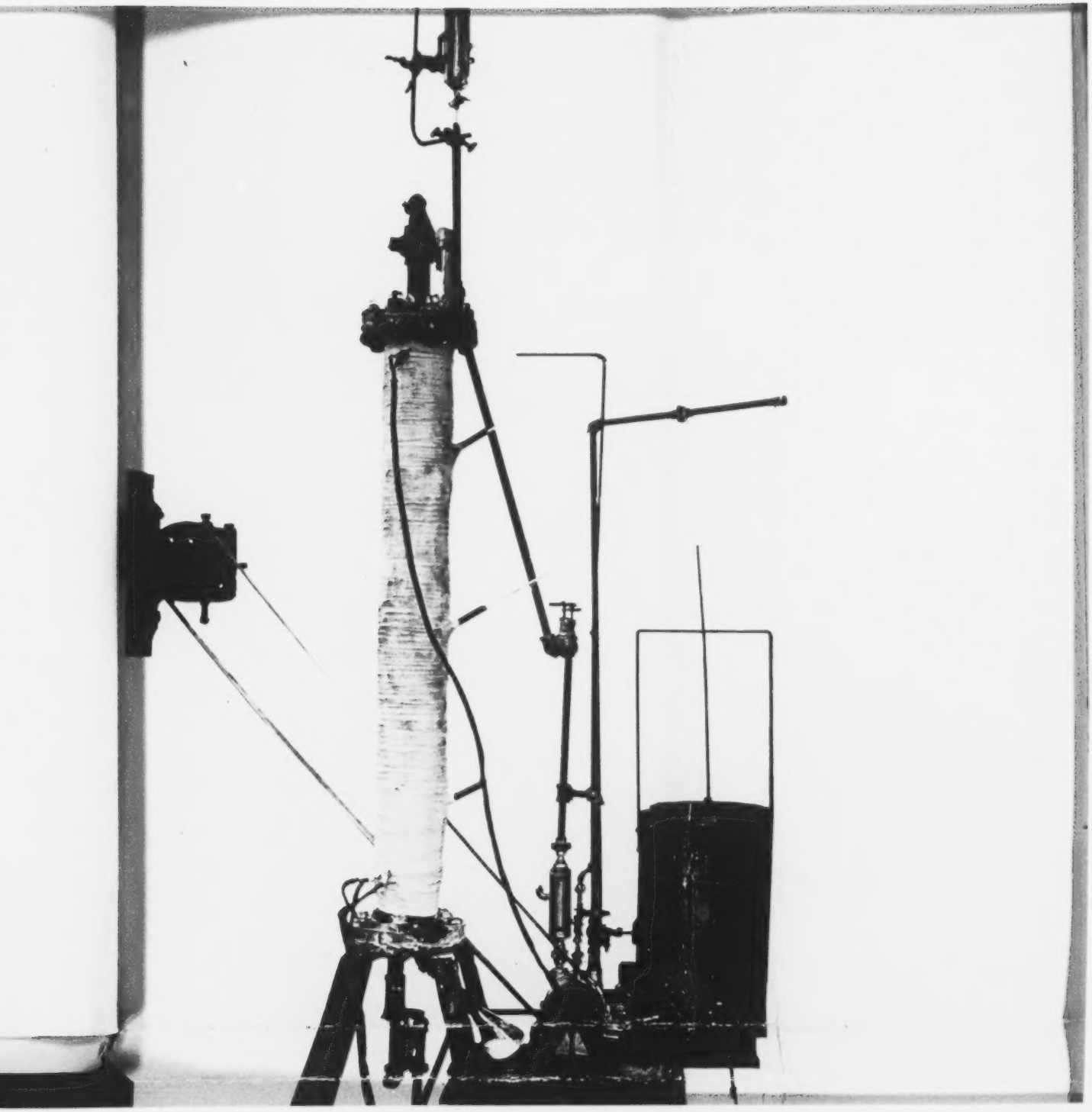

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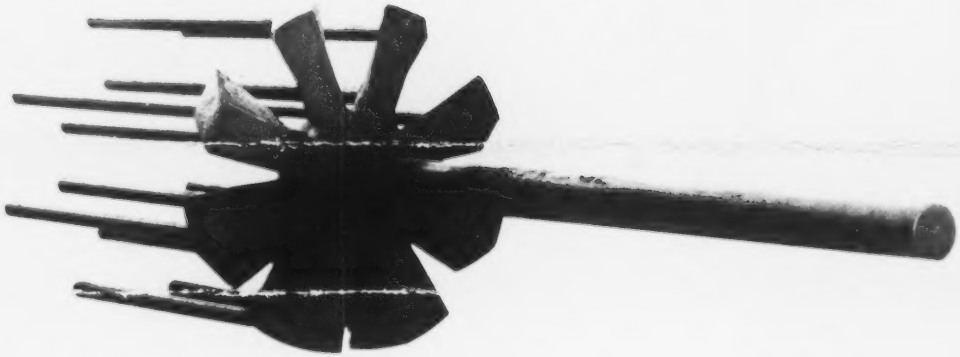

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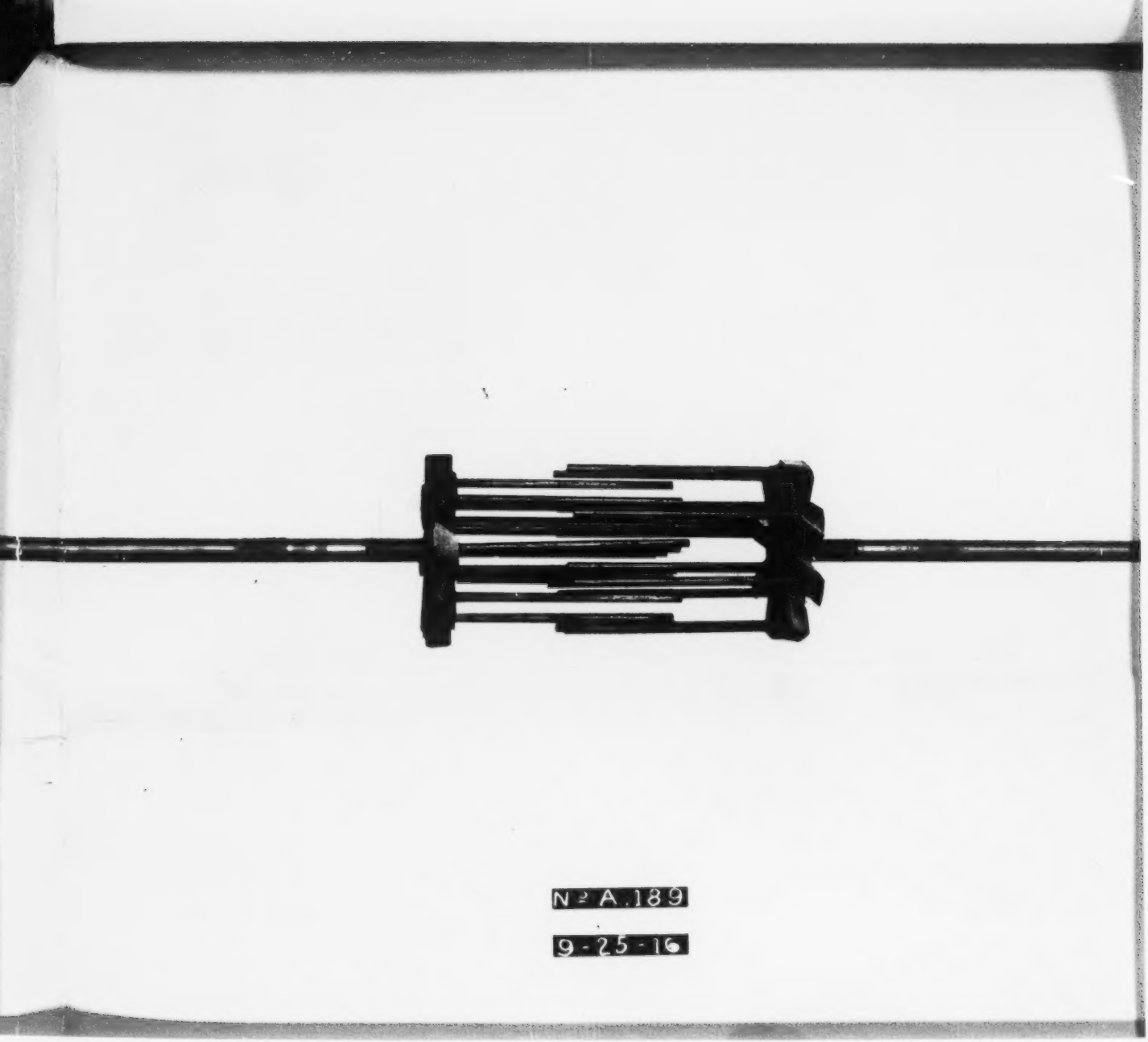

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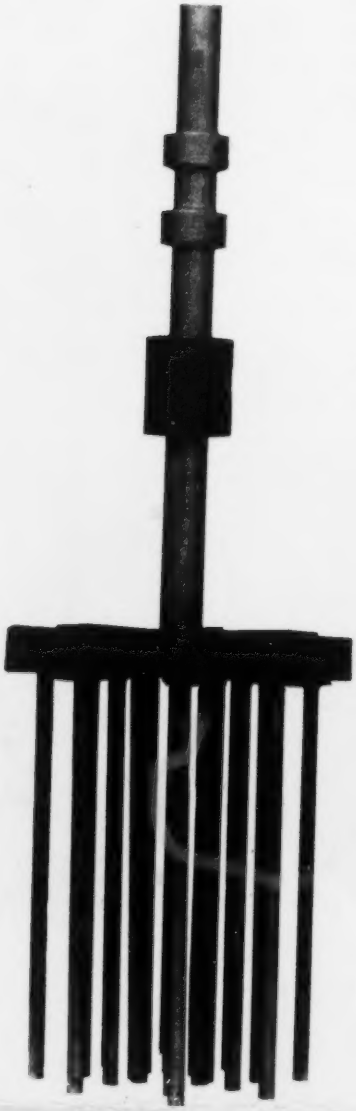

1014 DEFENDANT'S EXHIBIT V1.

The Procter & Gamble Co.

General Offices: Cincinnati.

CINCINNATI, Feb. 19th, 1915.

The Berlin Mills Co., Portland, Maine.

GENTLEMEN:

Recently our attention has been called to your Kream Krisp and as we are inclined to believe that in the manufacture and sale of this material you are infringing both our process and product patents, we would like to discuss the matter with you with a view of ascertaining if such is the case.

Hoping that this arrangement will be quite agreeable, we remain,

Yours respectfully,

THE PROCTOR & GAMBLE COMPANY,
(Signed) Per JNO. J. BURCHENAL.

March 12, 1915.

Mr. John J. Burchard, Care the Procter & Gamble Co., Cincinnati, Ohio.

DEAR SIR:

Your letter of February 19th at hand. In answer, will say that as we have no desire to infringe any patents, we should be glad to have you send us the patents, or numbers of patents, to which you refer. We could then talk with you more intelligently, if you still wanted an interview.

Please reply to the writer at Berlin, N. H.

Yours very truly,

BERLIN MILLS CO.,
O. B. BROWN,
Treas.

1015 The Procter & Gamble Co.

General Offices: Cincinnati.

CINCINNATI, May 1st, 1915.

Mr. O. B. Brown, c/o Berlin Mills Company, #235 Broadway, New York City.

DEAR SIR:

Your favor of the 12th ult. has failed of earlier reply, owing to the inattention of the writer and his absence from the city.

Answering your inquiry, we will say, that it will be very difficult to send you copies of the patents controlled directly and indirectly by us, but for your information we beg to advise that our patents cover the production and use of nickel catalysers in a very general way, and include the best known processes. In addition, we have product patents, covering the production of lard compound from hydrogenated fats, both in mixture with other oils and in partial hydrogenation.

It is our understanding from your advertisement, that your food product is a partially hydrogenated oil, and this material is fully covered under our patents. We think perhaps you would find it to your advantage to go into this matter pretty thoroughly, and if we can furnish any assistance, we will be very glad to do so.

Yours respectfully,

THE PROCTER & GAMBLE COMPANY,
Per JOHN J. BURCHENAL.

1016 May 19, 1915.

Mr. J. J. Burchenal, Procter & Gamble Co., Cincinnati, Ohio.

DEAR SIR:

In answer to yours of the 1st, will say that I shall be very glad to take up the matter about which you write and investigate the same thoroughly, and perhaps take advantage of your kind offer of assistance. It would further our investigation of this matter if you would kindly let us have the numbers of the patents which you believe might in any way be infringed.

Yours very truly,

BERLIN MILLS COMPANY,
O. B. BROWN,
Treas.

S.
1017 The Procter & Gamble Co.

General Offices: Cincinnati.

CINCINNATI, May 20th, 1915.

The Berlin Mills Company, Berlin, N. H.

GENTLEMEN:

Referring to your recent favor, we beg to state that in looking over your pamphlet on Kream Krisp, we find the statement—"although made exclusively from highly refined oil, it contains no oil itself. The oil is completely changed by hydrogenation."

If, therefore, the entire oil is treated as indicated by your pamphlet, this would infringe our patent No. 1,135,531. If the material is made by a mixture of cotten seed or other oils with hardened oils, it would conflict wth our patent No. 1,135,935. If your process of hardening is either in the production of a catalyser or in the use of same, it conflicts with the many patents controlled by this company. You would, of course, be infringing in this regard also.

If the matter interests you, we suggest that you take it up with us

further, with the idea of ascertaining just where your process and product conflicts with ours.

Yours very truly,

THE PROCTER & GAMBLE COMPANY,
Per JOHN J. BURCHENAL.

1018

The Procter & Gamble Co.

General Offices: Cincinnati.

Cincinnati, May 25th, 1915.

The Berlin Mills Company, Berlin, N. H.

GENTLEMEN:

Your favor of the 19th inst. received, and for which please accept thanks.

In reply we take pleasure in enclosing herewith a list of patents controlled, either directly or indirectly, by this company. In addition we have a number of applications.

Yours respectfully,

THE PROCTER & GAMBLE COMPANY,
Per JOHN J. BURCHENAL.

Patents of The Procter & Gamble Company.

1,001,279
1,004,034
1,004,035
1,008,474
1,023,953
1,016,864
1,022,347
1,024,758
1,029,901
1,079,278
949,954
1,026,339
1,135,351
1,135,935
1,134,745
1,134,746

1019

The Procter & Gamble Co.

General Offices: Cincinnati.

Cincinnati, July 20th, 1915.

The Berlin Mills Company, New York City.

GENTLEMEN:

In pursuance of your request of May 19th we sent you on May 20th information relative to our various patents. We have received

no acknowledgment from you of the receipt of this letter, nor any advices from you as to the course you propose pursuing, relative to the manufacture and sale of your product, which we understand you are still offering on the market.

We do not wish to appear discourteous, but we desire to have some definite information as to what you propose doing, relative to our inventions.

Hoping to be favored with an early reply, we remain,

Yours respectfully,

THE PROCTER & GAMBLE COMPANY,
Per JOHN J. BURCHENAL.

1020 July 29, 1915.

Mr. J. J. Burchenal, c/o Procter & Gamble Co., Cincinnati, Ohio.

MY DEAR MR. BURCHENAL:

We are in receipt of your favor of the 20th. In answer will say that we have looked over the papers which you sent us, and so far as we are aware the process and product followed by us differs in anything suggested in the various patents to which our attention has been drawn. As we have no desire to invade the rights of others innocently or otherwise, the writer would be very glad to meet you in New York at some convenient time. If you will write us when you expect to be in New York I will arrange my next trip there so that I can have an interview with you.

Yours very truly,

BERLIN MILLS COMPANY.
O. B. BROWN,
Treas.

1021 The Procter & Gamble Co.

General Officers: Cincinnati.

Cincinnati, August 2nd, 1915.

Mr. O. B. Brown, c/o Berlin Mills Company, Berlin, N. H.

DEAR SIR:

Your favor of the 29th ult. received, and for which please accept our thanks.

In reply we beg to state that the writer expects to leave here tomorrow for a vacation during August. It would hardly be possible to meet you in New York until some later date.

Having in mind your suggestion for an interview, we will arrange to have someone meet you in New York this month, or, failing in this, early next month.

Yours respectfully,

THE PROCTER & GAMBLE COMPANY,
Per JOHN J. BURCHENAL.

August 5, 1915.

Mr. J. J. Burchenal, c/o Procter & Gamble Co., Cincinnati, Ohio.

DEAR SIR:

I received your favor of the 2nd. I note that you will be away during August. I shall be glad to meet you in New York sometime next month.

Yours very truly, O. B. BROWN.

1022 The Procter & Gamble Co.
General Offices: Cincinnati.

Cincinnati, Ohio, September 18th, 1915.

The Berlin Mills Company, Berlin, N. H.

GENTLEMEN:

Referring to recent correspondence, the writer begs to state that he will be at the office of D. C. Link & Company, Produce Exchange, New York, at eleven o'clock Wednesday morning. If you care to have your representative call at that time, relative to a discussion of the subject along the line of our previous correspondence, we will be glad to meet him. Should you determine that to discuss the matter is unnecessary, we will assume you have decided to oppose our patents.

Yours respectfully,
THE PROCTER & GAMBLE COMPANY,
Per JOHN J. BURCHENAL.

1023 Sept. 27, 1915.

Mr. J. J. Burchenal, c/o Procter & Gamble Co., Cincinnati, Ohio.

DEAR SIR:

I sent you the following telegram the other day to the address that you gave me in New York:

"Sept. 22, 1915.

"J. J. Burchenal, c/o D. C. Link & Co., Produce Exchange, New York:

Your letter just received. Can meet you in New York Friday of this week or first part of next week. Please wire answer."

Your letter did not reach me until the day you were to be in New York.

I expect to be in New York sometime this week and can arrange my trip to meet you there at your convenience if you will wire me on receipt of this letter.

Yours very truly, O. B. BROWN.

S.

1024 The Procter & Gamble Co.
General Offices: Cincinnati.

Cincinnati, September 29, 1915.

The Berlin Mills Company, Berlin, N. H.

GENTLEMEN:

Your favor of the 27th inst. received, signed by your Mr. O. B. Brown. We also received the telegram addressed to the writer in care

of D. C. Link & Company, on September 22nd. The writer failed to answer this telegram, as he was unable at that time to state when he could be in New York, and we were under the impression that your Mr. Brown made his headquarters in New York, as we received several letters from that place.

We think the matter is of some importance, and should be settled promptly. The writer will, therefore, arrange to notify you of the time of his next visit to New York, if you care to arrange to meet him at that time. As his movements are somewhat uncertain, we cannot state definitely when he will be there, but in all probability it will be in about two or three weeks.

Yours respectfully,

THE PROCTER & GAMBLE COMPANY,
Per JOHN J. BURCHENAL.

Oct. 4th, 1915.

J. J. Burchenal, Cincinnati, Ohio:

Expect to be in New York at Berlin Mills Co.'s office, Woolworth Building, Wednesday and Thursday of this week. Please wire if you can meet me.

O. B. BROWN.

1025

Allen & Allen,

Attorneys and Counsellors.

Patent Causes.

Rooms 703 and 704 Gwynne Building, Cincinnati.

Alfred M. Allen.
Marston Allen.

November 10th, 1915.

Berlin Mills Company, Portland, Maine.

GENTLEMEN:

Our clients, The Procter & Gamble Company, have instructed us to prepare bill of complaint against you for infringement by the Kream Krisp product, put out by you, of the Burchenal letters patent No. 1,135,531, of April 13, 1915, owned by them.

We are advised that they have had up with you the question of this infringement, and that your position seems to be that you do not infringe.

From your advertising circulars, the can labels and the product itself, it appears very evident that your goods respond fully to the claims of this patent, and it has occurred to us that there must be some mistake in our understanding that you claim non-infringement.

We thought it proper, therefore, before instituting proceedings to notify you of our instructions, that any misunderstanding may be removed and that you may be formally advised that the manufacture and sale of Kream Krisp is regarded as a palpable infringement of patent No. 1,135,351, and that The Procter & Gamble Company can not permit this violation of their rights in the premises.

Yours truly,

ALLEN & ALLEN.

Date of Application, 5th Aug., 1887.
Specification Accepted, 6th Sept., 1887.

1026

A.D. 1887, 5th *August.* N° 10.783.

COMPLETE SPECIFICATION.

Improved Compound Preparation of Cotton-seed Oil.

I, JOSEPH SEARS of Chicago, Illinois, United States of America, Manufacturer, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement :—

This invention relates to a compound intended for use in cooking, as a substitute for lard or plain cotton-seed oil, and it consists in a non-fluid compound of refined but unbleached cotton-seed oil and an animal or vegetable fat adapted to impart to the mixture a desired degree of stiffness.

Heretofore cotton-seed oil has been used largely in the manufacture of refined lard, and it has also been used alone as a substitute for lard. In the former case it has been bleached to give the compound into which it entered the white appearance of lard. The bleaching of the oil, however, imparts to it a somewhat objectionable flavor, and the compound has been, on this account, properly considered as inferior to genuine lard, and regarded as an adulterated article. Pure, refined but unbleached cotton-seed oil is, on the other hand, destitute of all objectionable flavor and is admitted by those who have made comparative tests, to be in every respect fully equal or superior to genuine lard for cooking purposes. The only objection to such refined oil on the part of those accustomed to the use of lard, lies in its fluidity, which involves new and less convenient modes of handling it and dissimilar forms of packages.

It is the object of this invention to produce a compound having the distinctive merits and wholesomeness of refined cotton-seed oil without the objectionable quality heretofore given it in the attempt to produce a resemblance to lard in color, while also having the rigidity or non-fluid quality of lard by which it may be packed in the style of lard and manipulated by accustomed modes in the household.

To this end I compound with refined and unbleached cotton-seed oil a sufficient quantity of stearine or fat, to give the required consistency. The stearine of beef suet is preferred but that of other wholesome fat, either animal or vegetable, may be used, or the suet or fat itself, containing the oil as well as stearine, may be employed by using a larger relative quantity. In practice it is found that one part of the stearine of beef suet added to three or four parts of refined cotton-seed oil gives a compound

[*Price 4d.*]

1027

Sears' Improved Compound Preparation of Cotton-seed Oil.

having the desired rigidity, corresponding with that of ordinary lard. The stearine added to the cotton-seed oil is preferably also unbleached, but it may, within my invention, be bleached if desired, the bleaching of this ingredient having no seriously objectionable effect upon the flavor of the compound.

In the preparation of the compound described the mixture may be effected by raising the temperature of the oil sufficiently to melt the fat or stearine, introduced cold or in its solid state, or both the oil and the fat may be raised to the melting temperature of the fat or stearine and the heated ingredients then mixed. The compound, from a melting temperature of the several ingredients is chilled rapidly to prevent crystalization and separation.

In color the compound above described is essentially that of the refined and unbleached oil itself, though somewhat lighter owing to the presence of the stearine. This distinctive color is a desirable feature as it distinguishes the product from lard, of which it is not intended to be an imitation but for which it is a superior substitute.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed I declare that what I claim is:—

As an article of manufacture the herein described compound composed of refined, unbleached cotton-seed oil and a fat adapted to give a stiffness to the compound corresponding substantially to that of refined lard.

Dated this 5th day of August 1887.

HASELTINE, LAKE & Co.,
45, Southampton Buildings, London,
Agents for the Applicant.

LONDON: Printed by DARLING AND SON.
For Her Majesty's Stationery Office.
1887.

UNITED STATES PATENT OFFICE.

ROBERT H. McFARLAND, OF GRAND RAPIDS, MICHIGAN.

FOOD COMPOUND. 1028

No. 884,606. Specification of Letters Patent. Patented April 14, 1908.

Application filed April 1, 1907. Serial No. 365,866.

To all whom it may concern:

Be it known that I, ROBERT H. McFARLAND, a citizen of the United States of America, residing at Grand Rapids, in the county of Kent and State of Michigan, have invented certain new and useful Improvements in Food Compounds; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to a composition of material for making pastry, and particularly for making biscuits; and its object is to provide a compound of ready mixed ingredients requiring but the addition of moisture in the form of water, milk or other suitable liquid, such compound having the desirable quality of being mixed in a dry condition and remaining permanent in such condition for any desired length of time, whereby the same may be prepared in quantities and stored, transported and sold as an article of merchandise.

Heretofore it has been found necessary to combine the ingredients for making pastry shortly before using the same because the "shortening" ingredient therein has been some form of fatty substance such as butter, suet, lard or other fatty material, containing a considerable proportion of oil or oily substance. Such shortening material renders the mixture unfit for the proposed purpose, because the shortening will cause the particles of flour and other powdery materials to adhere, and form masses or lumps that soon become unfit for use, because the compound will soon decompose, or become "rancid" and thus wholly unpalatable and unfit for food by decomposition of the oil or oily ingredients therein.

I have discovered that the residue of hard fat compounds after the oils or oily parts thereof have been expressed will satisfactorily operate as a shortening, and when mixed with the other ingredients necessary to form pastry, the mixture will remain in powdered form and will also remain unchanged, and in proper condition for use, for a long period of time and under the usual conditions of storage and transportation.

My invention preferably consists of a mixture comprising a commercial stearin, which is the residue of a fatty substance after the oil, or oily portions have been removed therefrom, together with flour, seasoning and gas producing ingredients, such as a baking powder, as contra-distinguished from a compound containing a shortening of fatty substance from which the oil normally contained therein has not been removed.

I prefer to use a commercial stearin consisting mainly of a glycerid of stearic acid and derived from a hard fat by removal of the oil or oily ingredients normally therein. This stearin need not be chemically pure or derived from any particular animal or vegetable material, its essential feature being that the oil normally therein has been removed to such an extent that it will not cause the compound to adhere in lumps or to turn rancid, which result I have discovered has heretofore been due to the presence of the oil or oily ingredients which have been supposed necessary to the performance of the shortening function.

I prefer to use substantially the following ingredients in substantially the proportions named, to-wit: one hundred parts by weight, comprising finely comminuted or pulverized commercial stearin (substantially such as heretofore described) twelve parts; baking powder, ten parts; wheat flour, seventy-six parts; salt, two parts. These ingredients are to be intimately mixed by any convenient means and in a dry and powdery condition. When thus mixed they constitute suitable material to form pastry, and especially to form biscuits, by merely adding to the same a sufficient amount of moisture to form a dough, which addition may be of water, milk, or some other suitable liquid, as preferred.

This described compound will remain unchanged under all ordinary conditions of storage and transportation, and can be thus placed in proper packages for commercial purposes, and sold or stored or used as occasion may require.

I am aware that so-called self-rising flour has been made in which the gas producing element, commonly known as baking powder or some similar ingredient, has been mingled with the flour, but I believe it to be new, to provide a compound having therein an ingredient commonly known as "shortening" that can be mixed with the other dry ingredients necessary to form pastry in a dry condition, and that when so mixed will keep unchanged for any convenient length of time, it being heretofore customary to prepare compounds of this character by adding the shortening to the other ingredients immediately

1029 884,606

prior to use, for the reason that suet, lard, butter or other like fats will soon turn rancid or decompose when mixed with flour in suitable proportions for making pastry.

What I claim is:

1. A compound for making pastry, consisting of a dry mixture of finely comminuted stearin, substantially such as described, together with flour, baking powder and salt in about the proportions specified.

2. A compound for making pastry consisting of a mixture in substantially the following proportions: of commercial stearin, (substantially such as described) twelve per cent.; baking powder, ten per cent.; wheat flour, seventy-six per cent.; and salt, two per cent.

3. A compound for making pastry, comprising finely comminuted stearin (substantially such as described) combined with flour, in suitable proportion for use in making pastry, together with gas producing materials and seasoning substantially as described.

4. The combination of a shortening for pastry consisting of the residue of a hard fat after the oil or oily matter normally therein has been substantially removed therefrom, in combination with flour, baking powder and seasoning material in about the proportions specified.

In testimony whereof I affix my signature in presence of two witnesses.

ROBERT H. McFARLAND.

Witnesses:
PALMER A. JONES,
LUTHER V. MOULTON

1030 DEFENDANT'S EXHIBIT N2.

Literal Translation of Selected Parts

of

Articles by Sabattier & Senderens
(1905)

Translation by Donald Belcher.

Annales de Chemie et de Physique. Series 8, Vol. 4, p. 319 (1905)

New General Methods of Hydrogenation and Splitting of Molecules Based on the Use of Divided Metals.

By MM. Paul Sabattier and J. B. Senderens.

First part.

Generalities and Reactions of Hydrogenation.

It has been known for a long time that platinum black or platinum sponge induces that direct action of hydrogen upon various bodies; the union of oxygen is produced at ordinary temperatures; that with iodine takes place rapidly at 400; with nitric oxide there is the ready formation of ammonia.

It was known equally well that hydrogen occluded by palladium is much more active than the free gas; it will unite in the dark with chlorine and iodine, and combine in the cold with oxygen. It reduces the chlorates to chlorides, the nitrates to nitrites, and even to ammonia, it restores mercury to mercurous chloride, the ferric salts to the ferrous state; it decolorises indigo blue. Sulphurous
1031 anhydride is changed into hydrogen sulphide; arsenic anhydride into arsenic. Benzoyl chloride gives benzoic aldehyde, nitrobenzene furnishes aniline.

Hydrogen occluded by electrolysis in platinum or copper can furnish analogous effects, although less intensely; thus, according to Gladstone and Tribe (Chemical News, Vol. 37, 1878, p. 68) the result is the same for the metallic chlorides or for the nitrates; but, with nitrobenzene the reduction is arrested at azobenzene without attaining aniline.

From 1891 to 1896, in work on the oxides of nitrogen, we have discovered that certain divided metals, copper, cobalt, nickel, iron, obtained by reducing their oxides, have the property of fixing, by addition, nitrogen, peroxide, giving definite combinations—the metallic nitrides. In 1896, MM. Moissan and Moureu proved that if one directs a rapid current of acetylene over reduced cobalt, nickel or iron, as well as over platinum black, the gas is destroyed with incandescence; at the same time carbon and hydrogen are liberated, forming benzene, and the two scientists attributed the cause of the

phenomenon to a physical condensation, elevating the temperature, which is maintained finally by the heat of decomposition of the hydrocarbon.

Guided by the recollection of our metallic nitrides and hoping to realize a direct fixation over divided metals analogous to the carbines, we attempted in 1897 the reaction with ethylene, and observed that it gives at 300°, with nickel, an abundant carbonization, resembling that which MM. Moissan and Moreu had established with acetylene.

But we have attributed a chemical cause to this phenomenon;
1032 we have thought that a temporary combination with the metal takes place at the expense of the carbon compound, the combination being destroyed presently to regenerate anew, and to continue the reaction indefinitely. This temporary compound is without doubt a hydrogen compound of the metal; we thought also of causing not ethylene but a mixture of ethylene and hydrogen to act upon the reduced metal. We found that without the necessity of heating, the reduced nickel can accomplish indefinitely the direct transformation of ethylene into ethane. * * *

The use of reduced nickel as an active agent for direct hydrogenation, led also to the solution of a problem, until then very difficult to resolve in practice, the hydrogenation of the aromatic compounds. The study of many other reactions has led us to demonstrate the generality of the method with regard to volatile bodies.

We have, besides, proved that cobalt, iron and copper reduced to their oxides, just as platinum black or sponge, play, with varying degree, a role in hydrogenation similar to that of nickel, but less powerfully.

Our study of the catalytic effect of nickel and other divided metals has been pursued since 1897 without interruption, and we still pursue it. The results which we have obtained have already been made the object of twenty-four Notes published in Comptes Rendus de l'Academie des Sciences, and of various communications made to the Chemical Society. The present memoir has for its object the exposition, in its whole, of the general method of hydrogenation which we have instituted, and the principal results which it has furnished. In the Second Part we will indicate the various reactions of splitting
1033 and condensing molecules that the employment of reduced metals has permitted us to employ. * * *

(Page 323). To prepare the metals it is well to commence with an oxide well freed from chlorine and sulphur. The best results are obtained by dissolving the metal in pure nitric acid, and then forming the oxide by calculation of the nitrate at a dull red.

The reduction of the oxide should be done by pure hydrogen; it is important that it contains no trace of chlorine or sulphur. The reduction should take place at low temperatures, always lower than that of redness, or else the activity of the metal may be greatly reduced or even annulled. Nickel reduced at a red heat hardly reacts at all, while that reduced below 300° possesses such an extreme activity that it is soon exhausted. Usually, it is preferable to prepare the nickel at about 350°. The temperature of 300° is the most convenient for copper. For cobalt it should react practically at 400°. With iron the reduction is much more difficult; at 450° it is necessary

to pursue the action of the hydrogen for 6 or 7 hours to attain complete transformation from the oxide into the metal.

Reduced nickel and copper are not only much more easy to prepare than iron and cobalt, but they have, besides, this advantage—the oxides are easily reduced below 200°, so that it is not necessary, in hydrogenations conducted below this temperature, to take account of the slight oxidations which they can undergo, because of traces of oxygen introduced with the substance to be hydrogenated. The oxide, if formed, cannot exist, and regenerates the metal with the formation of water.

1034 As for iron, the slowness of its reduction would be a real obstacle to its use as a practical metallic catalyser, if its use had other advantages. But, on the contrary, it is in all cases much less active than nickel. * * *

(p. 331.) In the most frequent case, where these materials (to be hydrogenated) are liquid, we have found it convenient to cause the hydrogenation to arrive first, reducing the oxide to the metallic catalyser, at the back of the tube. When the reduction is completed, and the tube has been cooled in hydrogen, the stopper at the other end is replaced by a stopper furnished with a capillary tube which distributes the liquid. * * *

(p. 332 et seq.)

Duration of the Activity of the Metallic Catalyser.

The action of divided metals reduced from their oxides, is comparable in a measure to that of living ferments. The action of the latter comprises three phases, an initial period when the catalyser accustoms itself to its function, a period of normal function, and finally a period of decline, ending in the death of the ferment.

The first period is a variable state which is generally of short duration: it corresponds without doubt to the superficial modification which the metal undergoes, when, in the atmosphere of pure hydrogen which surrounds it, the vapors of the substances mixed or unmixed with hydrogen take the place of the pure hydrogen.

The second period of normal function is generally very long, and would be indefinite if there were not in the system some trace
1035 of material capable of altering in some way the surface of the metal. In practice, with the hydrogen well purified, the hydrogenation of pure and very volatile substances can be realised for a long time by the same reduced nickel without apparent fatigue. Thus the same tube of nickel can accomplish the transformation of benzene into cyclohexane for a month, the action being interrupted each evening to be resumed the next morning. The slight oxidation which the metal has undergone during the rest of the night in the cold tube, being of no inconvenience because the oxide is newly reduced by the hydrogen at the temperature of 180° at which the reaction is carried on.

The same nickel has effected for several weeks the transformation of phenol into cyclohexanol at 200°.

The function of the metallic catalyser can be rapidly diminished,

however, and even stopped, if there is in the hydrogen or in the treated substance, a trace of certain materials which constitute true poisons for the mineral ferment. Chlorine, above all bromine and iodine, and sulphur, even in extremely minute doses, paralyze entirely the activity of the reduced nickel.

Nickel, obtained by the reduction of its oxide which contain a little chlorine, is almost deprived of its catalytic activity. The same is true in the case of sulphur. The presence of the hydrogen of slight traces of hydrochloric acid, hydrogen sulphide, or of hydrogen selenide, produces the same disastrous effects and produces rapidly the same inactivity of the nickel.

Traces of bromide in phenol submitted to hydrogenation have paralysed very rapidly the catalytic activity of the reduced
1036 nickel. It is the same with traces of the products to thiophene in benzene or toulene.

Reduced copper is a catalytic agent much less active than nickel, but it is much less sensible to toxic influences which act so violently upon the latter metal.

Practically, after a longer or shorter period of activity, it is found that the mineral ferment is enfeebled. It grows old, and this ageing is indicated by a dim-*ution* in the proportion of material transformed. The cause of this weakening, comparable at least in appearance to the ageing of organic ferments, is certainly the slight alteration of the surface, progressively endured by the grains of catalyser. It may be that traces of chlorine, bromine, oriodine, or of sulphur, introduced by the hydrogen or the substance, have affixed themselves to the metal, causing it to lose its activity. It may rather be that under the prolonged action of the transformed organic material the metal has undergone a progressive carburation, which, after a certain limit is reached, weakens its catalytic action. It may be, finally, that a slight deposit of a carbonaceous or tarry substance on the surface of each grain renders more and more difficult the necessary contact between the metal and the gas.

When the fatigued nickel is dissolved in dilute hydrochloric acid it is always shown that beside the escape of fetid gas, rich in hydrocarbons, there is a deposit of a certain amount of brown carbonaceous material. * * *

(P. 335 et seq.) To avoid effects of this nature, it is necessary to watch with care that in the various reactions which are
1037 carried on the metal is never wet by an excessive afflux of the liquid being treated, or an accidental lowering of the temperature of the tube. In the preparation of cyclohexanol and its homologues from the phenols or cresols a preparation realised at a temperature a little higher than the boiling points of the latter, it happens sometimes that the nickel is wet, and immediately it becomes a little less active, because the surface of the metal is without doubt modified permanently by contact with cresol or phenol in the liquid state.

Choice of the Temperature of Reaction. The catalytic action of the various divided metals should always be exercised within definite limits of temperature, according to each reaction and the nature of

the metal. Practically, a lower limit of the temperature of the metal is imposed by the necessity of maintaining in the gaseous state in the tube both the products to be transformed and those which result from the transformation.

Within a certain limit, the increase of the temperature has the advantage of accelerating the reaction, and, as a result, of increasing the proportion of material transformed during the traversing of the tube. But beyond a certain value, often near the temperature at which the reaction commences, there is often a profound modification of the phenomenon.

Particularly in the reactions of hydrogenation realised with nickel, a temperature too elevated leads to the predominance of the catalytic action which the metal exerts on the products of the reaction, and this leads to a destruction or reversal of the action which it is desired to accomplish. Thus the fixation of hydrogen upon
1038 benzene in the presence of reduced nickel takes place readily when the metal is maintained between 70° and 240°. But if the temperature is raised to 300°, the cyclohexane formed is broken up according to the equation.

$$3\ C_6H_{12}=2\ C_6H_6+6\ CH_4$$

with the production of methane and the regeneration of benzene. It is, then, absolutely necessary to work at temperatures well determined. But the interval of temperature at one's disposal is generally extended through quite a range so that it can be conducted in a tube heated directly over a combustion furnace, as has been mentioned before.

According to a general rule, the actions which can be accomplished indifferently by the different reduced metals are only catalysed by copper at a temperature much higher than that for nickel. For cobalt the temperature is intermediate.

Explanation of the Catalytic Action of the Divided Metals.

The actions which can be induced by the catalytic action of the divided metals are very numerous and of a varied nature. Doubtless it would be rash to attribute them all to a single cause. Doubtless, many of them may be referred to distinct mechanisms, but in the case of each, the enormous surface of the metal must of necessity count. The activity is, as a matter of fact, in an intimate relation
1039 with the importance of the surface, which is immense in the case of the reduced metals, especially when they have been prepared by reduction at a temperature slightly elevated. With the metals in the shape of filings or as compact masses obtained at a red heat, the phenomena of catalysis are of little importance. We believe that all these actions can be explained by the production of unstable intermediate compounds formed upon the surface of the metals. Thus, hydrogenations are easily explained by the formation of a hydrogen compound of nickel, cobalt, copper, or platinum,

which as soon as it is generated, reacts with the volatile material which is in contact with it. The regenerated metal unites again with the hydrogen; the hydrogen compound recommences its action and the fixation of hydrogen continues indefinitely, if hydrogen and the material to be hydrogenated are supplied. It is conceded therefore that the different hydrogen compounds of the metals have different aptitudes. * * * One, explains thus how platinum and copper which hydrogenate well compounds of acetylene and ethylene, are incapable of hydrogenating the aromatic ring, while nickel effectuates the latter readily. A theory based on a simple physical condensation cannot in any way take account for these differences. * * *

(p. 486.) The experiments which we have described show that we can utilize the divided metals, especially nickel and copper reduced from their oxides, to produce a great number of varied reactions of which some are new, and of great interest. The common characteristics of the great part of these reactions is that they are generally accomplished without any visible modification of the metal by which they are performed, that is the latter acts as a catalyser. 1040 It is a true mineral ferment, comparable to soluble ferments and ferments from yeast, but having an endurance much superior, and frequently unlimited, when the reaction which it catalyses does not modify its nature.

The reaction of gaseous hydrogen upon volatile matter in the presence of reduced nickel maintained below 250° constitutes a new method of hydrogenation, as general and as powerful as the already known methods. Among the most importance results which the application of this method has furnished, we recall the easy transformation of ethylene compounds into saturated compounds; the reduction of nitro compounds; the very advantageous preparation of primary or secondary alcohols from aldehydes and acetones, reactions which could be accomplished by the old methods by hydrogenation but which are much more readily realized by our method, whenever the substances are volatile. Our new method permits also of effectuating readily certain hydrogenations practical-y irrealizable by the old methods: direct hydrogenation of carbon monoxide, carbon dioxide with the production of methane; direct hydrogenation of the aromatic ring, a fertile reaction which permits the synthetic production of naphthenes, cyclic alcohols, and cyclic amines, in great quantities, which could only be done before by laborious and complicated processes. These hydrogenations which the old methods could not accomplish are realized solely by nickel (in a certain measure by cobalt), but not by copper and platinum, to which nevertheless, belongs the faculty of ordinary hydrogenation, aside from the reserved cases.

1041 DEFENDANT'S EXHIBIT O2.

Reduction of the Unsaturated Linoleic Acids to Stearic Acid.

Part II.

Thesis by Fred Bedford.

University of Halle, 1906.

Translated by Samuel P. Sadtler, July, 1914.

Part II.

Reduction of the Unsaturated Linoleic Acids to Stearic Acid.

K. Peters[1] as well as Reformatzky[2] state that they had obtained stearic acid from Linoleic acids by heating with fuming hydriodic acid and phosphorus, followed by treatment with zinc and hydrochloric acid. It has, however, already been noted in the introduction that in this connection statements as to the quantity of stearic acid are entirely wanting. Inasmuch as neither the Linoleic acid produced by debromination of hexabrom-linoleic nor a hexoxy acid obtained by the oxidation of the linoleic acids had been as yet converted into stearic acid, there was wanting any proof of the fact that linoleic acid had been actually reduced to stearic acid. It was, in the present state of our knowledge, just as readily possible that the linolenic acid was derived from a hydrocarbon with an abnormal linking or that it might be a cyclic unsaturated
1042 acid, such as Power and Cornall[3] had recently shown in the case of Chaulmoogric acid.

I must doubt whether, in any case, Linoleic acid had been reduced to stearic acid by the process of Peters and of Reformatzky. I had not succeeded with experiments made under varying conditions with hydriodic acid. If 5 cc's of Linolenic acid (from hexabrom acid) are heated in a sealed tube for from 8 to 10 hours to a temperature of from 200° to 210° with an equal volume of fuming hydriodic acid and 2½ grams of red phosphorous, not the slightest trace of stearic acid could be obtained from the product of the reaction with zinc and hydrochloric acid.

I did not have any better result either with the purified Linolinic acids, because in this case, probably in consequence of the addition of water, there always formed substances with higher oxygen content than the Linolenic acids themselves. I gave up these hopeless experiments and turned myself to another method of production, the apodization which is not only very convenient, but also makes possible

[1] Monatsh. f. Chem. 7,552 (1886).
[2] Journ. f/per Chemie II. 41. 529 (1890).
[3] Journ. Chem. Soc. 1904, 843.

the conversion of the unsaturated Linoleic acids into stearic acid in a quantitative way.

This is a modification of the process given by Sabatier and Senderens, according to which organic substances in vapor or gaseous form, together with hydrogen gas, are led over finely divided metallic nickel. This process can be applied also, as I found, to very differently vaporizable substances, if the latter are allowed to drop gradually upon pieces of pumice-stone which have been prepared with metallic nickel and hydrogen passed over at the same time.

A quantitative determination I have made possible in this
1043 case by starting with an exactly measured quantity of pure hydrogen gas and determining the excess of hydrogen by converting it into water.

The apparatus used by me is shown in Sketch 2. The glass flask F, of about 18 litres capacity, is intended for the holding and for the measurement of the hydrogen. It is closed with a double bored cork x, which allows the tube r^1 and r^2 to pass through it, and further, it is surrounded by metal mantle m which contains water. This water surrounding the flask F serves to bring the hydrogen gas to a uniform temperature. The flask F enclosed in M rests with its neck below upon a triangle, which has been placed in a wide vessel G made of sheet zinc and filled with water. The latter is provided with a tubulure in the side wall, which is closed with a rubber cork. Through this rubber cork goes a glass tube r^4, which under water is connected with the copper delivery tube r^1. r^1 is so bent that its upper end, carrying a piece of rubber tubing upon it, forms the highest point in the interior of the glass flask placed in a slightly oblique position. In this way it is possible to force the gas out of F to the last bubble by the aid of water which flows in through the water connection r^3.

The hydrogen passes the cylindrical-formed glass vessel E which contains four tube connections a, B, y, d. a is a tube, fused into the cylinder, which continues in the interior with a right-angled bend to about 6Cm. from the bottom of the cylinder; on the outside
a is connected with r by rubber tubing.

1044 The connection y serves for the filling of F with hydrogen. B is the exit opening, while the connection *d* is joined by a long piece of rubber hose with a water-funnel H.

W is a drying flask containing concentrated sulphuric acid, which also serves to control the rapidity of the current of gas going through. Between W and E there is found a three-way connection made of glass tubing with the stop-cocks h^1, h^2, and h^3. The stop-cock h^1 serves to connect with a gas-holder h^2 containing nitrogen, h^2 for the connection with an iron flask containing commerciad electrolytic hydrogen.

S is a glass worm cooled by liquid air, which serves to remove from the gases the last trace of moisture.

In the apparatus K, which I will call the catalyzing apparatus, takes places the addition of hydrogen to the unsaturated compound which is slowly dropping through the funnel T. For this purpose

the two tubes of the catalyzing apparatus, fused together into one piece, the wide tube k^1 (of 25 Mm. diameter) and the narrower tube k^2 (10 Mm. in diameter), are provided with prepared pumice-stone. This pumice-stone, prepared with nickel, I have made in the following way:

Pure nickel carbonate is changed by strong ignition in a nickel crucible into oxide, the nickel oxide stirred up with a little distilled water (which must be free from chlorine), to a cream, and ignited pumice-stone, in pieces the size of a pea, are put into this mass. After stirring them around well, the individual pieces of pumice-stone are taken out with a pair of pincers and dried on a large watch-crystal in a drying oven, at a temperature of 95°. The nickel-oxide
1045 pumice-stone is then filled into the tubes k^1 and k^2 so that in each tube there is a layer 11 Cm. in length. The reduction of the oxide to metallic nickel takes place in the apparatus itself. The heating of the catalyzing apparatus to a definite temperature is effected by an oil bath.

The glass vessel B with the chloride of calcium tube b fused to it is also cooled with liquid air, and serves to condense the vapors of the organic substance, which pass out of the catalyzing apparatus.

A second small chloride of calcium tube *a* is arranged connected to the combustion tube V containing copper oxide. Here the combustion of the excess of hydrogen to vapor of water takes place, which is then condensed in the tube A by the aid of liquid air. The chloride of cailcium tube e^1 is fused onto A and U is also a tube filled with chloride of calcium for protection.

With the apparatus put together in the way just described the work is then done as follows:

1. Determination of the Capacity of the Measuring Flask.

The exact measurement of the flask F intended for the holding of the hydrogen is of fundamental importance for the process. It can be done in two ways: (*a*) By weighing a flask taken out of its mantle, filled with distilled water at a definite temperature, in which case the content of the tube connection r^4—*a* is to be added on, while the volume occupied by the tube r^1 and the cork *s* must
1046 be subtracted; or (*b*) by filling the flask F, including the tube-connection to its end *a* with hydrogen, burning the latter to water and calculating the volume of the flask from the weight of the water formed.

I have preferred the latter method, the result of which, however, I took the opportunity of controlling also by the method of weighing and obtained almost the same figures for the volume determined in the two ways.

For the filling, commercial electrolytic hydrogen served, which in order to obtain it perfectly free from oxygen was previously passed over glowing copper. This hydrogen, of the purity of which I convinced myself by a gas analysis, was conducted through a glass tube connection joined by *y* by means of a piece of rubber tubing.

F (and the tube connection to the end at *a*) was previously filled

with boiled water and closed off by q^1, while the connection with r^2 and r^3 was opened under water. The water level in E, regulated by the funnel F, is to stand at the mark n^1. The stop-cock q^2 is closed; the stopcock h^3 now opened, and through h^2 connection is made with the outside air. When the air in E is completely displaced by hydrogen h^3 is closed. The water level in E is dropped to the mark n^2 and q^1 is opened. q^3 must now be closed.

F now fills up with hydrogen as the displaced water flows out to r^2. During the filling F is cooled from without by cold top water, the escape of which from the metal mantle is regulated by a syphon.

When F is filled and bubbles of gas escape from r^2, the hydrogen current is slowed down, q^2 and then q^1 closed, q^3 opened.
1047 h^3 slowly opened, and just closed off by the water level *a* rising again. The hydrogen inflow is broken off at *g*, the tube *g* closed by a piece of rubber tubing containing a glass plug; inflow and outflow of the cooling water in M is stopped off. Now allow the gas, preferably to stand over night and then one can be perfectly sure that it has taken the temperature of the surrounding water. Now measure this temperature with the thermometer divided in tenths of a degree, not the barometer reading, and open q^1. Inasmuch as the hydrogen in F is under a slight excess pressure, gas bubbles will escape in *a* towards E, the interior of which stands in connection with the atmosphere through h^2. Now the gas in F stands at atmospheric pressure, increased by the small water column nn^1 (this ordinarily amounts to 4 Mm. equal to 3/10th of a millimeter mercury.)

After equalizing the pressure, q^1, is again closed. E is then rinsed out with nitrogen, which can be introduced through H^1.

In order to burn the measured amount of hydrogen quantitatively, the coil S is connected with a small chloride of calcium tube, and this with the previously weighed chloride of calcium tube *a* by means of a glass tube. Chloride of calcium tube *a* is for the purpose of absorbing water vapor, which sometimes, when the liquid air in the vessel X has been freshly filled in, comes back out of the combustion tube V.

The combustion now takes place as in the case of an elementary analysis, the hydrogen gas being led over the glowing copper oxide (in the form of wire) which is contained in V, and the water vapor resulting is caught in the weighed tube A. Because of the
1048 large amount of the water which forms here, the absorption tube A, filled with liquid air, has proven to be very practical, while chloride of calcium as an absorbent material would quickly liquify.

The driving out of the hydrogen from F takes place after forming the connection r^2 r^3 by the aid of the pressure of a water column of about 2 meters. The last bubbles of gas can be removed from the flask finally by gently turning the tube r^1 without any difficulty. One finally allows water to pass over towards E until this vessel also is filled with water. Then q^1 is closed and the hydrogen which fills the whole connected apparatus is displaced by nitrogen.

The current of gas is so regulated that 6 to 7 meters of hydrogen

can be burned in an hour. The combustion therefore requires a period of from 2½ to 3 hours. During this time the liquid air which vaporizes in the vessels X and Z is to be replaced by filling them. After the end of the combustion A is taken off, closed at e, which U remains connected until weighed. The latter can be done after two hours' time when the ice has melted. A is also weighed and any increase in weight of the water from this added on.

The following four experiments which were carried out, enabled me to settle upon the volume of the flask F and at the same time to judge of the limits of error of the process.

Experiment.	Temperature of H.	Barometer reduced to O°—water column mm¹.	Increase in weight of A—a. water found.	Hydrogen found.	Volumes found.
I	21,20°	754,9 mm.	13,3081 g	1,4885 g	18487 cc
II	18,85°	754,8 mm.	13,4608 g	1,5057 g	18483 cc
III	21,00°	753,9 mm.	13,3121 g	1,4890 g	18500 cc
IV	20,15°	751,7 mm.	13,2936 g	1,4870 g	18449 cc

1049 For the calculation the ratio of hydrogen to oxygen is taken as 2 to 15,88, and the weight of a litre of hydrogen at 0° and 760 Mm. pressure as 0,089,925 grams. With this understanding the volume of the flask F was determined with an average of 18,480 C.Cm. The largest variation in the four experiments amounted to 51 C. Cm., which is 0.28 percent. of the whole amount of hydrogen. The availability of the quantitative reduction process, which was now undertaken, was first tested on unsaturated liquid compounds of undeniable purity. From 5 to 0 grams of liquid substance were put into a funnel T and weighed with this. The funnel was then placed above the catalyzing apparatus K, after the nickel pumice-stone had been first reduced.

The reduction was accomplished by heating K in an oil bath to from 275 to 285 degrees and passing hydrogen through it, which was brought into the stop-cock h^2 direct from a hydrogen bomb. During this operation the communication between K and B was opened and K was connected at its exit with a short capillary tube. The passing of the hydrogen must continue as long as condensed water is visible in the capillary tube. A tolerably long time—about 8 hours—was necessary for the reduction.

When the nickel pumice stone is reduced in this way the oil bath is allowed to cool down to from 180 to 170 degrees without interrupting the hydrogen current. The weighed funnel T is fixed on; the coil S is cooled with liquid air, h^2 is closed, the combustion tube containing copper oxide is heated, and the hydrogen still remaining in the connected apparatus is displaced by nitrogen, which
1050 is allowed to enter through h^1 and streamed through from 20 to 25 minutes. Now K is connected with B and thereby with the other half of the connected apparatus. Liquid air put into Y and Z, h^1 closed, and finally the measured amount of hydrogen gas in F brought in through h^3. After several minutes h^4, the stop-cock of the funnel T is opened far enough to allow about 4 drops per

minute to fall from T on to the nickel pumice-stone. The current of hydrogen is now regulated in such a way that after all the oil has dropped through, hydrogen gas continues for half an hour longer, passing through the apparatus. The removal of the last trace of hydrogen from F and from the whole connected apparatus follows in the way already described.

The water is also determined here from the increase in weight from A-a. That of the little tube *a* never exceeds 0.01 grams. By weighing the dropping funnel after analysis, the weight of the oil used is obtained by difference.

To obtain the product of the reaction which has been taken up by the nickel pumice-stone, the catalyzing apparatus after removal from the oil bath, is allowed to cool in a current of hydrogen (out of the bomb). The contents emptied into a soxhlet Apparatus and extracted with ether. The nickel pumice-stone is then to be used for new experiments after having had it heated previous for one hour at 250° in the catalyzing apparatus with hydrogen.

I have observed that more accurate results are obtained with nickel pumice-stone which has been already used, while with newly reduced nickel oxide they come out somewhat too high. The reason
1051 of this is that nickel oxide under the conditions already given is not perfectly reduced by hydrogen at 280°, so that in a later experiment some of the measured hydrogen is still needed for water formation; this small amount of water is held back in B. Nickel which has once been reduced by hydrogen in the presence of organic vapors is free from this drawback. By the reduction of non-volatile substances, such as Oleic acid, or Linoleic acids, the increase in weight of B should not amount to more than several centigrams. The following check analyses were all carried out with nickel which had been previously used at least once. Before every main experiment a qualitative test had been carried out with a like amount of nickel pumice-stone without measuring the hydrogen.

1. *Reduction of Oleic Acid to Stearic Acid by Gaseous Hydrogen.*

The Oleic acid was obtained from E. Merck and was distilled by me with a high vacuum. A determination of the Iodine figure of this preparation gave 87.5. The theoretical Iodine figure is 90. Two reduction experiments were carried out. The reduction product extracted with ether from the nickel pumice-stone in the first case had a melting point of 64.5° and an Iodine figure of 4.1. In the second experiment the Iodine figure was 0 and the melting point 69°. In this latter case pure stearic acid had been produced, while in the first case a small amount of oleic acid had escaped reduction. In
1052 the quantitative calculation this small amount of unchanged oleic acid calculated from the Iodine figure was subtracted

The nitrogen which must be perfectly free from oxygen I prepared according to the method of Berthelot (Bull. Soc. Chem. (2) 13, 3, 4) and finally passed over ignited copper.

from the weight of the substance used. The quantitative results are shown in the following table:

Hydrogen used, 18,480 Cc. to 195°.
Temperature of the oil bath, 190°. Iodine figure 87.5.

Experiment.	Temperature of the hydrogen.	Barometer reduced to O — the water column mm.	Increase in weight of A + a. water found in gms.	Hydrogen found in grams.
I	18.25°	757.6 mm.	13,2033	1,4768
II	20.15°	755.6 mm.	12,9870	1,4526

Hydrogen used in grams.	Hydrogen absorbed in grams.	Iodine figure of the reduction product.	Substance as weighed.	Substance used, corrected by the iodine figure.
1.5160	0,0392	4.1	5,6917	5,4250
1,4973	0,0447	0,0	6,0000	6,0000

Oleic acid $C_{18}H_{34}O_2$ (M=280.1). According to theory will add on .714 per cent. of hydrogen. This number I designate as the hydrogen number of Oleic acid. According to my experiments they are added on.

Experiment.	Substance grams.	H. gr.	Hydrogen number found.	Percentage of the theory.
I	5,4250	0.0392	0.7226	101.2
II	6,0000	0.7450	0.7450	104.3

It is to be noted that the accuracy of the determination, especially in the case of Oleic acid, becomes unfavorable because of its high molecular weight and the addition of only two hydrogen atoms. Six grams of Oleic acid add on 476 C.Cm. of hydrogen at 0° and 760 mm. An error of 50 C. Cm. of hydrogen, therefore, means for the result of the experiment an error of 10½%. The accuracy must
1053 be much greater for substances which contain several double linkages or a lower molecular weight.

2. *Reduction of Crotonic Ethyl Ester to Butyric Ethyl Ester by Gaseous Hydrogen.*

The sample was obtained from Kahlbaum and had a boiling point of from 136 to 137 degrees. Inasmuch as the statements in the literature with regard to the boiling point of this ester vary somewhat[1], I have myself esterfied solid Crotonic acid of melting point 72 as a control. If this esterification is carried out with alcohol and hydrochloric acid gas, we do not obtain at all a homogeneous body, but a chlorine-containing mixture consisting of Crotonic ester and monochlorbutyric ester, because in the operation hydrogen chloride adds on in notable amount. The same experience was obtained here, therefore, as had been previously obtained in the esterfication of Linolenic acid although this unsaturated acid added on hydrochloric acid more difficult-y than the Crotonic acid. When I used concentrated surphuric acid in place of the hydrochloric acid (25 grams of

[1] Krämer and Grodski (Ber. 11,1359) given the boiling point as 142 to 143 degrees, Brühl (Ann der Chem. 235,9 (1886) as 138°.

Crotonic acid, 5 Cc.s of of sulphuric acid and 100 Cc.s of absolute alcohol were boiled for three hours with inverted condenser) I obtained a Crotonic Ethyl ester of constant boiling point and distilling at the same temperature as the Kahlbaum preparation.

The reduction of this Crotonic ester with hydrogen is carried out at 165 to 170°. Inasmuch as the boiling point of the sub-
1054 stance is lower, the form of the catalyzing apparatus was modified as is shown in Sketch 2-A.

The substance drops upon the heated nickel pumice-stone in the tube k[1], is here changed into vapor and mixed with hydrogen, passed over the nickel pumice-stone contained in the two branches of the U tube which are fused together, and then is condensed in the cooled glass bulb B. The change of the catalyzing apparatus therefore consists only in the lengthening of the layer of the nickel pumice-stone.

At the end of the reduction experiment with Crotonic ester almost the entire amount of the reaction product was found in B. A small amount, however, was held back in the nickel pumice-stone, from which about 0.2 grams of oil were obtained. This reaction product had the pronounced odor of butyric ethyl ester, boiled at 120 and did not add on any trace of Bromine. The reduction of Butyric ethyl ester was therefore quantitative, as the following figures will show:

Used 18,480 Ccs. of hydrogen.
Temperature of the oil bath, 165° to 170°.

Temp. of the H.	Barometer reduced to O—water column mm[1].	Inc. in weight A—a water found in grams.	H. found in grams.	H. used in grams.	H. absorbed in grams.	Substance used.
16.80°	749.95	12.7117	1.4219	1.5109	0.0890	5.0548

The Crotonic Ethyl Ester, $C_6H_{10}O_2$ (M=113.2) has a theoretical hydrogen number 1.7667. The experiment gave:

Substance in grams.	H. in grams.	Hydrogen number found.	Percentage of theory.
5.0548	0.0890	1.7607	99.7

1055 3. *Reduction of Linoleic Ethyl Ester to Stearic Ethyl Ester by Gaseous Hydrogen.*

After the availability of the method had been established by the test analyses, I submitted the Linoleic Ethyl Ester obtained from the hexabromide and purified by distillation in high vacuo to the same reduction with hydrogen[1].

The product obtained extracted with ether from the nickel pumice-stone had in the first experiment a melting point 32.8° (after once recrystallizing from alcohol ether 33.7°) and an Iodine number 3.6.

[1] If the preparation contains even traces of chlorine, as is the case when hydrochloric acid is used for esterfying the catalytic action of the nickel is completely killed thereby.

while in the second experiment the melting point was 33.5° and the Iodine number 0. Stearic acid ethyl ester fuses according to Heinz at 33.7°. After saponification there was obtained from the reaction product stearic acid with a melting point of 69°, which was submitted to analysis. 0.1996 grams of Substance yielded 0.5541 grams of CO_2 and 0.2230 grams of H_2O.

Found %.	Calculated for $C_{18}H_{36}O_2$ (M = 282.14).
C. 75.71	75.98
H. 12.50	12.76

The quantity of the hydrogen added on in the two experiments is shown from the following table:

Used 18,480 Ccs. of hydrogen, 170° to 180°.
Temperature of the oil bath, Iodine number 219.8.

Experiment.	Temperature of the hydrogen.	Barometer reduced to 0°—the water column mm.	Increase in weight of A + a. water found in grams.	Hydrogen found in grams.
I	17.35°	760.8	12,7775	1,4292
II	16.60°	758.7	12,7220	1,4231

1056

Hydrogen used in grams.	Hydrogen absorbed in grams.	Iodine figure of the reaction product.	Substance as weighed.	Substance used, corrected by the iodine fig.
1.5290	0.0998	3.6	5.2080	5.1227
1,5302	0.1071	.0	5,2475	5,2475

The hydrogen number of the linoleic ethyl ester $C_{20}H_{32}O_2$ (M = 304) is 1.9737. There are found:

Experiment.	Substance.	H. in gr.	Hydrogen number found.	Percentage of the theory.
I	5.1227	0,0998	1,9482	98.7
II	5,2475	0,1071	2,0408	103.4

From this it follows that the ester tested had actually had on 6 atoms of hydrogen and that Linoleic acid contains a normal chain of 18 carbon atoms.

4. Reduction of the Ethyl Esters of the Purified Unsaturated Linoleic Esthers by Gaseous Hydrogen.

It was not of interest to know how much hydrogen the unsaturated acids of linseed oil after removal of the Oleic acid would add on. For this experiment the Ethyl Esters prepared according to Page 27 and freshly distilled in high vacuo served.

The result of the qualitative test was that also in this case pure Stearic acid Ethyl Ester was easily obtained.

The Iodine number of the reaction product in three different experiments was as follows:

I—3.6 II—0.0 III—29.4[1]

The fusing point in Experiment II was 32.2°; Experiment III, 27.5°.

1057 There formed in the reduction in very small amount (several Centigrams) a volatile substance smelling of butyric ester, which condensed in the glass bulb B, and was also observed in the reduction of the Linolenic Ethyl Ester (Page 40). The quantity was too small to identify this substance certainly. In quantitative way the hydrogen addition took place as follows:

Used 18,480 Ccs. of hydrogen, 190 to 195.
Temperature of the oil bath, Iodine number 178.1.

Experiment.	Temperature of the hydrogen.	Barometer reduced in O—the water column nn[1].	Increase in weight of A + a. water found in grams.	Hydrogen found in grams.
I	21.25°	751.5	12,5146	1,3999
II	21.40°	753.7	11,9581	1,3376
III	19.60°	764.3	12,8148	1,4335

Hydrogen used in grams.	Hydrogen absorbed in grams.	Iodine figure of the reaction product.	Substance as weighed.	Substance used, corrected by the iodine fig.
1,4807	0,0808	3.6	5,6700	5,5555
1,4840	0.1464	0.0	10,0407	10,0407
1,4983	0.0653	29.4	5,4160	4,5219

The hydrogen number of Linolenic Ethyl Ester is 1,9737, of Linoleic Ethyl Ester, however, only 1,3072. The hydrogen numbers obtained lie between these. Under the assumption that the Oleic acid had been completely removed from the mixture, these results in the three experiments the following amount of Linolenic Ethyl Ester:

Experiment.	Spbstance in G.	H. in grams.	Hydrogen number found.	Per cent of linolenic ester.
I	5,5555	0,0808	1,4544	22.1
II	10,0407	0,1464	1,4578	22.6
III	4,5219	0,0653	1,4441	20.5

or a Mean of 21.7%.

1058 Summary.

I have shown by my investigation that the solid Hexabromide of Linolenic Acid, which is obtained from the crude fatty acids of linseed oil by treatment with bromine in a yield of 41.6% of the

[1] The nickel pumice-stone for Experiment III had been prepared by another method and was somewhat less active.

substance taken, is a well characterized acid, the salts and esters of which I prepared and analyzed. This Hexabrom-a-Linolenic Acid $C_{18}H_{30}Br_6O_2$ results from the ready addition to Bromine to a Linolenic Acid $C_{18}H_{30}O_2$, contained in linseed oil, which acid I will designate as a-Linolenic Acid.

The Liquid Tetrabromide, which forms at the same time in the bromination of the crude acids of linseed oil and which was investigated by Reformatzky[1], must be referred to a-Linoleic Acid $C_{18}H_{32}O_2$, which is isomeric with the ordinary Linoleic acid contained, for instance, in poppy oil, which I designate as B-Linoleic Acid.

The crystallized Hexabrom a Linolenic Acid I have debrominated by boiling with zinc turnings and alcohol, and in this way obtained an acid $C_{18}H_{30}O_2$, which was analyzed and also characterized more exactly by its Ethyl Ester.

I showed that this Acid on renewed addition of bromine yielded only partially a solid Hexabromide. It contains therefore a-Linoleic Acid but consists for the larger part of an isomeric B-Linoleic Acid, which yields a liquid bromide and appears to add on readily from the four bromide atoms.

a-Linolenic Acid, as it is contained in Linseed Oil and
1059 a-Linoleic Acid, as it is contained in poppy oil, yield according to this difference solid bromine products, B-Linolenic Acid and B-Linoleic Acid, on the other hand, liquid products.

From my investigation we find further that the unsaturated acids of Linseed Oil even after removal of the Oleic acid consist of a mixture, the direct separation of which by fractional distillation in high vacuo is not possible but which acids, however, by direct adding on of hydrogen are so completely changed over into stearic acid that only acids of 18 carbon atoms can be present in this mixture.

The process of hydrogen addition, of which the method of Sabatier and Senderens is the basis, I have developed to a quantitative method in such a way that the amount of the hydrogen adding on to a weighed unsaturated compound can be exactly determined.

The percent. of hydrogen which an unsaturated compound takes up I call the "Hydrogen Number," in the same sense in which von Hübl has used the expression "Iodine Number." The "Hydrogen Number," it is true, is much more difficult to determine than the Iodine Number, but I recognize a great advantage in those constants obtained by the new process in this respect, because a real smoothly working chemical reaction and one leading to a well defined end product lies at the basis of them, which in the case of the Hübl Iodine addition method is in no way the case. How differently unsaturated acids behave to Iodine and how lacking in simplicity the chemical process of the Hübl method is, and how badly defined the end
1060 products resulting are, has been especially noted by C. Liebermann and H. Sachse.[1]

1. Journ. f. pr. Chem. 41,529 (1890) also Hazura obtained this liquid Tetrabromide (Monatsh f. Chem. 9,180 (1888), but stated it erroneously.

1. Ding. pol. Journ. 253, 281 (1884).

1—Ber. 24,4117 (1891).

Although, therefore, the Iodine number of Oleic acid and its glycerides, so commonly used in fat analysis, give a value approximating the theory, we are in no sense justified in concluding, without further consideration, that the same thing takes place with acids containing several double linkings, which as yet are unknown in the pure state, as in the case with the Linolenic Acid of linseed oil.

To establish the availability of the new addition method, the hydrogen figures of Oleic acid and of Crotonic Ethyl Ester were determined. The numbers obtained came close to the theoretical.

In the same way the mixture of B. and a. Linolenic Acid of the formula $C_{18}H_{30}O_2$ obtained by debrominating Hexabrom a. Linolenic Acid yielded the corresponding hydrogen number.

On the other hand, for the unsaturated Linolenic Acids, freed from Oleic Acid, a hydrogen number was obtained for the Ester which lies between Linoleic and Linolenic Ester, so that a percentage averaging 21.7% of Linolenic Acid was obtained therefrom.[2]

An Iolinolenic Acid, such as Hazura, assumed in Linseed oil, I have not found therein. The conclusion which Hazura draws as to the existence of a Isolinolenic Acid in Linseed Oil from the substance obtained in the oxidation of the acids of Linseed Oil
1061 potassium permanganate, would of itself not be conclusive even if his statement about these oxidation products were less uncertain and if they had not been contested by other investigators.

Inasmuch as the Linseed Oil acids taken for oxidation were themselves a mixture and in the oxidation of each of the constituents again different products (oxy acids, lactones, anhydrides) were to be expected, the oxidation products would therefore represent a complicated mixture of various substances, from which it is very difficult, if not impossible, to isolate individual constituents in a pure state.

An amount of 65% of that hypothetical Isolinolenic Acid in the acids of linseed oil is certainly absolutely excluded. On the other hand, the unsaturated acid of linseed oil, according to my determination of their hydrogen number, contain 78% of Linoleic Acid (essentially B-Linoleic Acid) and 22% of Linolenic Acid, which is essentially, if not entirely, a.Linolenic Acid. Thus out of the Hexabrom a.Linolenic Acid, obtained by the treatment of the crude linseed oil acid from bromine we reckon an amount equalling 15.3% a.Linolenic Acid already for this crude linseed oil acid, which still contains solid fat acids and Oleic acids. We must also remember in this connection that the solid Hexabrom a.Linolenic Acid is not fully precipitated, but a certain amount of it remains dissolved in the oily mother liquor.

Therefore, the amount of Isolinolenic Acid (or B. Linolenic Acid) certainly can only be very small.

2—From the Iodine Number 178.1 of this Linolenic Ethyl Ester, an amount of 16% of Linolenic Acid is reckoned. According to the above considerations however, this Number is unreliable and certainly too small.

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FATS AND THEIR ECONOMICAL USE IN THE HOME.[1]

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CONTENTS.

	Page.		Page.
Introduction	1	Economy in the use of fats	17
General nature of fats	2	Utilization of waste fats	20
The place of fats in the diet	3	Rendering and clarifying fats	22
Digestibility of fats	4	Savory fats	23
Sources and kinds of edible fats	6	Softening hard fats to make them more satisfactory for shortening purposes	24
Animal fats	8	Care and storage of fats in the home	25
Vegetable fats	12	Summary	26
The selection of edible fats	15		

INTRODUCTION.

The fats in the ordinary diet fall naturally into two groups, those eaten because they happen to be components of foods, like the fat in milk, meats, or fish, and those like butter, salad oils, or lard, which are added to other foods in cooking or serving. The housekeeper interested in the economical use of fats in the home must take into consideration fat as contributed by both groups. Obviously, the kind and quantity of the first group of fats eaten are determined by the foods making up the diet, and this is governed largely by individual tastes and local or family food habits. As regards this group, economy involves chiefly the proper selection and combination of foods containing fat in abundance with other foods containing little of it, so as to secure a diet supplying the proper proportions of protein and carbohydrate as well as fat. As this matter

[1] Prepared under the direction of C. F. Langworthy, Chief, Office of Home Economics.

NOTE.—This bulletin contains information regarding the character, selection, and use of edible fats in the home, much of the material being based on investigations made in the laboratory of the Office of Home Economics of the States Relations Service. It is of interest to teachers and students of domestic science, housekeepers, and others concerned with the problems of food selection and preparation.

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of the nature and use of foods (some rich in fat) has been considered in other bulletins of this series, the present publication is concerned chiefly with the second group, or the added fats. For convenience the added fats may be subdivided into table and culinary fats. Table fats are those like butter and table oils, which are most commonly used as an accompaniment to food to secure a desired flavor or texture, and culinary or cooking fats are those which are incorporated with other foods (as shortening) or used as a medium for cooking foods, as in frying. Economy in the use of the added fats involves the intelligent selection of the different kinds, so as to secure the sort best adapted for a particular purpose, and the careful use in the home of the fats selected. It is the purpose of this publication to consider briefly the nature of fats, their value in the diet, and their digestibility; to describe the great variety of table and culinary fats on the market; and finally, to consider the economical selection and use of fats in the home. It is believed that such knowledge will prove helpful in buying and using fats to the best advantage.

GENERAL NATURE OF FATS.

The appearance and physical properties of the common fats and oils used for food purposes are too well known to require much description here. Chemically considered, fats consist chiefly of glycerids of fatty acids. The fatty acids whose glycerids are most common in edible fats are oleic, linolic, palmitic, and stearic. One fat differs from another primarily in the proportions of these esters which it contains and in the presence or absence of small quantities of other substances, such as free fatty acids and characteristic flavoring and coloring bodies.

The melting point or hardness of any fat depends on the relative proportions of these acids present, and fats containing large amounts of combined oleic and linolic acids are soft or liquid, while those containing large amounts of palmitic or stearic acid are solid. This follows whether the respective acids are combined as triglycerids or as mixed glycerids.

The color of some of the crude fats and oils varies from light yellow to red, or even black, but the refining processes remove a great proportion of the color-giving bodies, and the pure fats and oils are a pale yellow or colorless when liquid, and white or creamy white when solid.

The flavors and odors of fats are probably due to the presence in them of small amounts of difficultly removable substances rather than to specific properties of the pure fats themselves, in view of the fact that flavors and odors become much less noticeable the more completely the fats are purified. The characteristic flavor of butter, for example, is due to the absorption by the fat of the substances

formed in the fermentation of milk and cream by lactic acid and bacteria and to the presence of small particles of the curd. Similarly, the by-products, such as butyric acid, which are formed by the action of undesirable bacteria, may be absorbed by the fat and give rise to the undesirable flavor of butter of poor quality or that which has deteriorated. Musty flavors are doubtless due to the presence of the products of metabolism of molds which may be present in the fats. In the case of some fats, like those of beef and mutton, or the fish oils, it has apparently been impossible to remove entirely the flavor-giving substances by the ordinary methods of refining.

The exact nature of the compounds causing the rancid taste and odor of fats is not known. It is believed by some investigators that free and unsaturated fatty acids are first formed by the hydrolysis of the fats and that in the presence of light and air these fatty acids are oxidized to odoriferous compounds (aldehydes, ketones, etc.), the presence of which is thought to be identical with rancidity.

Very little is known of the nature of the combinations formed when culinary fats and other food materials are mingled in doughs, batters, etc. It is not definitely known to what extent these are mechanical mixtures and to what extent the ingredients have undergone chemical and physical changes. It is probable that the texture, and consequently the thoroughness of digestion of the finished bread or cake, depend in some degree upon such factors, and more information on this subject is desirable in order that the culinary processes may be more completely understood and controlled.

THE PLACE OF FATS IN THE DIET.

The chief value of fats in nutrition is that they furnish energy which the body requires to perform its work. The ideal diet should contain sufficient quantities of fat and carbohydrates to insure it the required amount of energy, as well as a sufficient quantity of protein to supply the necessary nitrogen for growth and repair of the body, also mineral matter for growth and other body needs, and vitamins or similar bodies required to render the diet adequate for maintenance. Since fats furnish 2¼ times as much energy, pound for pound, as do proteins and carbohydrates (1 pound of fat furnishing about 4,000 calories, and 1 pound of protein or carbohydrate only about 1,800 calories), and since they are both wholesome and palatable, they are very commonly used to increase the energy value of the diet. Furthermore, they are especially useful as a source of energy where an excess of carbohydrates in the diet is to be avoided, as in cases of diabetes or certain forms of indigestion.

The consumption of some fat is apparently universal, although the amount eaten varies within rather wide limits. The diet in the polar regions represents one extreme, fat being used in quantity with

meat, which is the chief article of diet. Though it seems to be less well known, it is nevertheless true, that fats are also eaten in considerable quantity in tropical countries, as is evident when one recalls the coconut oil of the South Sea Islands and the olive oil and other fats so much used in cookery in other regions characterized by a very warm climate. As everyone knows, dwellers in temperate regions use fat in the diet in many ways, which are determined largely by the prevailing food habits and the kinds of fat procurable, and in quantities which bear a more or less direct relation to the amount of physical work performed. Men engaged in severe work out-of-doors often eat large quantities of fatty foods. Workmen in lumber camps, for instance, relish a diet of pork and beans and other fat foods which would be too hearty for the office worker or clerk. It is difficult to obtain any definite figures for the quantity of fat eaten by the average person, but in 1,300 dietary studies of families, carried out among different races and in different countries, it was found that the average quantity of fat eaten was about 4½ ounces per person per day, the variation recorded being from 1½ to 13 ounces per person per day.

While fats and carbohydrates may replace each other to a considerable extent, recent investigations indicate that some carbohydrate supplied by the food or formed in the body from protein is essential for the combustion of fats in the body. Experts in nutrition and dietetics, therefore, believe that neither one should be used to the exclusion of the other.

DIGESTIBILITY OF FATS.

While all fats yield approximately equal amounts of energy when burned outside of the body, the energy which the body actually derives from each is dependent upon its digestibility; that is, the proportion which the body retains. The digestibility of a number of the individual fats[1] has been determined, and the information at present available indicates that fats in general are very thoroughly digested; more so, indeed, than the animal or vegetable proteins and the starch occurring in the ordinary mixed diet. Such slight differences as have been observed in the digestibility of individual fats evidently correspond to differences in their melting points. Available evidence indicates that fats such as mutton fat, having a melting point higher than the body temperature, are less completely assimilated than those melting at a lower temperature, such as lard, butter, olive oil, and cottonseed oil. Also, it has been shown by feeding experiments with laboratory animals that animal and vegetable stearins (melting above body temperature) are only

[1] U. S. Dept. Agr. Bul. 310 (1915).

very slightly assimilated by the body when eaten alone, whereas, if mixed with palmitin and olein digestibility is increased because, no doubt, the mixture has a lower melting point than the stearin by itself.

The digestive disturbances often attributed to eating fat are probably due not so much to the inability of the body to digest the fat itself as to other factors, chief among which are bad cooking, overeating of foods containing fats, and rancidity. Laboratory experiments have shown that under some conditions, when fats are overheated, a chemical compound called acrolein is formed. This substance is especially irritating to the mucous membranes of the eyes, nose, and throat, and it is well known to housekeepers that when fats are scorched vapors are given off which cause the eyes to water. If any of these vapors were occluded in the food during frying it seems probable that similar irritation would be produced on the delicate mucous membrane of the digestive tract. Obviously, such digestive disturbances can not be cited as proofs of an incomplete digestion of fats.

Disagreeable sensations are experienced by some people after eating large quantities of foods such as meats containing much fat interspersed with the muscular tissue, and overrich puddings or salads. This may be explained by the fact that the digestive juices of the stomach have little solvent action on such nonemulsified fats and are thus hindered from digesting the protein which is covered by or very intimately mixed with the fat. The passing of the food through the pylorus into the small intestine is thus delayed until the fat has become separated from the lean portions by the enzymic and mechanical action of the stomach. For this reason very fat meats, for instance, remain a longer time in the stomach than lean meats, although in the end they are as thoroughly digested. Similar digestive disturbances are sometimes experienced after eating fried foods (cooked without scorching) or foods in which fat is incorporated in such a manner that it prevents the digestive juices from acting upon the protein and carbohydrates. This delayed digestion is often mistaken for diminished or incomplete digestion. Fats which have become rancid, even though the rancidity is not sufficiently marked to influence the flavor very much, may cause digestive disturbances in some people. That this is not always the case is evidenced by the fact that there are some oriental people who eat rancid butter or oils apparently by preference.

It must be remembered that there are some persons whose systems can tolerate little if any food rich in fats. This, like the inability of some to eat strawberries, onions, or other foods, without digestive disturbances, is a matter of individual peculiarity.

SOURCES AND KINDS OF EDIBLE FATS.

The fats eaten in the ordinary mixed diet are furnished chiefly by such foods as fat meats, butter, milk, and cream, but are also present in smaller amounts in pastry, breads, eggs, cheese, cereals, etc. Fat meats like pork (including lard) and beef furnish about 59 per cent of the total fat in the average American diet, ac-

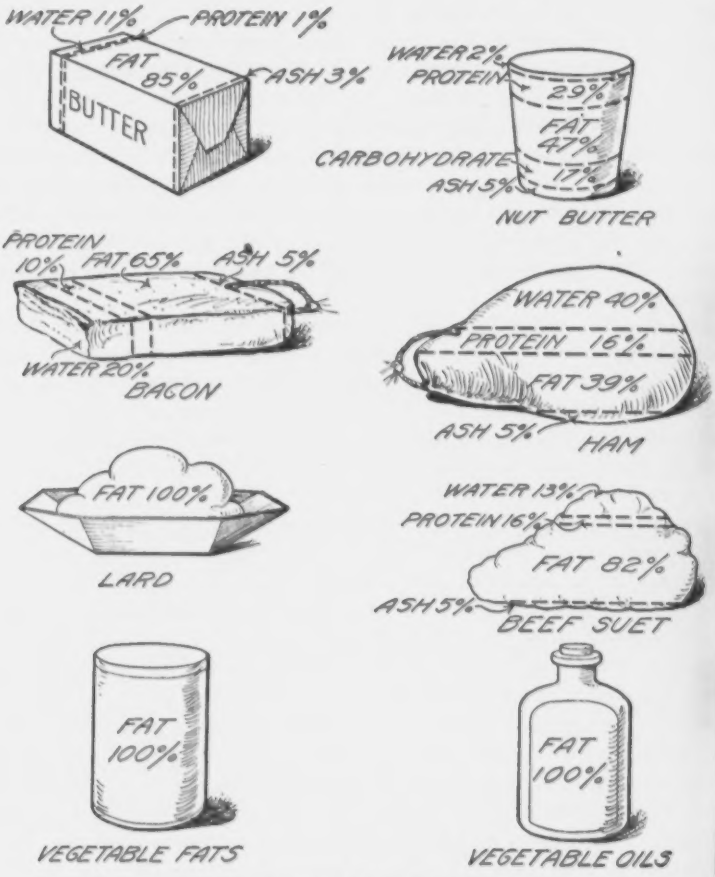

FIG. 1.—Composition of some common fatty foods.

cording to the results of about 400 studies as reported in an earlier publication of this office.[1] The same investigations showed that dairy products, including butter, milk, cream, and cheese, furnish about 26 per cent of the total fat; cereal products, including

[1] U. S. Dept. Agr., Office Expt. Stas. Circ. 110 (1911).

cakes and breads, about 9 per cent; eggs about 3 per cent; and fish about 1 per cent. Some kinds of fish contain considerable fat and offer a means of adding it to the diet. One-tenth of the edible portion of such fish as the catfish, salmon, butterfish, trout, shad, and a smaller proportion of other common fish consists of fat. The composition of some of the foods which are important sources of fat in the diet is shown in figure 1. The amount of energy supplied by these foods depends on the quantity of fat which they contain, the pure fats like lard or vegetable fats furnishing 4,080 calories per

FIG. 2.—Energy furnished by one pound of common fatty foods.

pound, and those containing other ingredients like water or protein naturally having a lower energy value. For comparison the energy furnished by 1 pound of some of the common fatty foods is shown graphically in figure 2.

Not many years ago the fats used in this country were obtained almost entirely from the two groups of farm animals, cattle and hogs. Butter and cream were the ordinary table fats, and it was the general custom for each family to obtain its own supply of lard, which was the chief cooking fat, from the pigs slaughtered

on the farm. Beef and mutton fats, or tallows, as they were generally known, were used in cooking to some extent in the form of "dripping" obtained from cooking meats, but found a much wider use for candle and soap making. Chicken fat was also used in a limited way. As the population began to concentrate in cities and towns, the introduction of central slaughterhouses and rendering plants made it possible to obtain both meat and fat separately in such ways as met individual requirements, and home rendering of fats quite generally disappeared except in rural regions. The increasing population created a demand which soon exceeded the available supply obtained from slaughtered animals, and this made it necessary to seek additional sources of edible fats. Naturally, olive oil, used for food purposes in some parts of Europe and the Orient and less generally in the United States, suggested the possibility of the utilization of other vegetable fats, and as the methods of refining were improved cottonseed oil came to be very commonly used, and, to a less extent, coconut, peanut, and corn oils. At the present time there are also a number of vegetable fats on the market, some of which are simply refined and used alone or in admixture, while others have been treated by special processes designed to render them harder or otherwise changed in character. In the following pages general information is given regarding the nature, source, and use of some of the more important edible fats.

ANIMAL FATS.

BUTTER.

Butter is the most popular and widely used of all fats in the United States, it being estimated that from 17 to 18 pounds per capita are consumed yearly, most of it for table purposes. Its food value is due largely to the energy it furnishes, which is about 3,500 calories per pound. It consists of the fat of milk, some water, and a little curd and added salt. Butter is of two kinds, salted and unsalted. Commercial butter contains approximately 82.5 per cent of fat, which consists chiefly of palmitin and olein with small amounts of myristin, butyrin, and other glycerids of the fatty acids. The color varies considerably with the nature of the food material eaten by the cow; the yellow is deeper in summer when green food is eaten. It is a common practice to add vegetable coloring matter, especially during the winter months, to intensify the natural color. Since butter tends to deteriorate easily, care in its manufacture is necessary to secure a wholesome product with good keeping qualities. The milk from which the cream is separated should be free from disease-causing bacteria as well as from microorganisms which would produce undesirable flavors or odors in the butter. For this reason

in many creameries the milk or cream is pasteurized to kill undesirable organisms, and the ripening of the cream is started and controlled by the addition of a pure culture of bacteria which produce the desired flavors. Care must also be taken in the handling and storage of butter to prevent it from becoming contaminated with disease-causing bacteria or from absorbing undesirable odors or flavors. Such precautions, necessary to secure a wholesome product, naturally add to the cost of butter, but obviously from the standpoint of health are well worth the higher price. Butter of inferior quality is frequently treated by a commercial process which removes the objectionable odor and taste and then marketed as renovated or "process" butter. As many housekeepers know, strong butter can be made more palatable by washing it repeatedly in clean, cold water and then resalting; if the final washing is done in milk a better flavor is obtained. The commercial process of renovating butter is somewhat similar to this domestic process. The butter is melted, and air is blown through it until the undesirable flavor due to volatile substances is carried away. The product is then emulsified with soured milk and worked like ordinary butter. Renovated butter sells for a lower price than fresh butter, and for this reason it is used quite extensively in cookery, and to some extent for table purposes. If the process is carefully carried out it is of good flavor. Naturally, the sale of renovated butter as fresh butter is prohibited by the Federal and State pure-food laws.

Rendered butter, called "ghee" in India, is preferred by some people to ordinary butter. It is easily prepared by melting the butter with or without adding water and allowing the mixture to become cold, when the layer of butter fat is removed; if desired, salt is added to replace that removed in rendering.

CREAM.

Cream, which contains from 18 to 40 per cent of fat, should be regarded as one of the available fats. It is generally used as a table fat, being served with cereals and fruits, as a constituent of ice cream, and plain or whipped with jellies or puddings. In rural regions, where the supply is large, both sweet and sour cream are commonly used for shortening, but to a less extent in cities and towns, where cream is more expensive. Cream is very palatable to most persons, and for this reason it is often prescribed by physicians for people who require a diet rich in fats. A form of cream more common in England than here, and known as "Devonshire Clotted Cream," is prepared by heating to about 180° F. whole milk on which the cream has been allowed to rise, cooling the mass, and skimming off the cream. It has a light-yellow color and a character-

istic nutty flavor, is much thicker than ordinary cream, and contains about 60 per cent of fat.

LARD.

Pork fat is one of the more widely used of the animal fats, being eaten in a variety of forms, such as bacon, ham, fresh and cured pork, and lard, which is used principally for culinary purposes. The best grade of lard, commonly known as leaf lard, is rendered from the fat which surrounds the kidneys of the animal, but commercial lard is often rendered from any or all of the fatty portions of the animal and could be more exactly termed pork fat. Since lard contains a relatively small amount of the harder constituents of fats, it has a moderately low melting point and so is easily handled in the preparation of doughs. This is a reason why some housekeepers prefer it to harder fats for shortening purposes, especially in cold weather. For some special shortening purposes lard may be too soft and require hardening by chilling before use. Pure lard should be white in color and practically free from taste or smell. Home-rendered lard may contain varying amounts of water, according to the mode of rendering, but that containing the smallest quantity has the best keeping qualities; the commercial product contains practically no water. Formerly lard was sometimes adulterated by the addition of different substances, but with more stringent regulations this has practically ceased, and the commercial product is generally wholesome and prepared under sanitary conditions from animals which have been inspected before slaughter.

BEEF FAT.

Beef fat contains a large amount of stearin and is therefore harder than either butter or lard. The hardness and other characteristics of beef fat, as well as other animal fats, vary somewhat according to the part of the body from which they are obtained; for example, brisket fat, from the breast of the animal, is softer than rendered suet, the fat surrounding the kidney. The hardness of beef fat, and its rather pronounced flavor, which is unpleasant to some people, have doubtless prevented its more extensive use for culinary purposes. Many attempts have been made to remove the flavor, but apparently no method has been discovered which gives results satisfactory enough to warrant its use on a commercial scale. Finely chopped unrendered suet is quite often used for shortening in such dishes as suet puddings. Rendered beef fat, or tallow, as it is sometimes called, is used by many people for shortening purposes, being mixed with butter or some other fat to soften it. It is sometimes sold in the market for this purpose, and in many homes beef suet or small scraps of fat trimmed from roasts, etc., are rendered for use in shortening and

frying. Rendered beef suet has no general use in this country as a table fat, but in Europe people with small incomes often eat so-called drippings on their bread in place of butter. These drippings are sometimes obtained from roasting or broiling beef, but in many cases are simply rendered suet.

MUTTON FAT.

Mutton fat, called also mutton tallow or suet, contains a relatively large amount of stearin and is, therefore, classed commercially as a hard fat. It is used in the manufacture of stearin for soap making, and small quantities of the more highly refined grades are used in the manufacture of toilet creams and other cosmetics. Edible mutton fat is now prepared in considerable quantities, the mutton tallow and mutton stearin being used as ingredients of lard substitutes and the mutton oil as an ingredient of the lower grades of oleomargarine. Mutton fat is eaten to some extent in most homes as a constituent of fat mutton or lamb and in gravies served with such meats. Mixed with softer fats it is occasionally used in the home for shortening and frying, but much less so than pork and beef fats. This, no doubt, has been due to the characteristic mutton flavor, which is unpleasant to many people, to the hardness of the fat, and in some degree to the smaller available supply.

POULTRY FATS.

Poultry fats resemble butter and lard in consistency, and recent investigations show them to be as thoroughly digested as other fats of the same degree of hardness. That they are wholesome and palatable is indicated by the fact that they are very frequently eaten as a constituent of gravies, broths, and soups. Many housekeepers consider poultry fat very useful and desirable in cookery, but the total quantity of poultry fats used in this manner is relatively small, owing to the limited supply. In the household small quantities are obtained in dressing and cooking fat poultry, but the only available commercial supply is that obtained from very fat birds drawn at the market for those who do not desire the excess fat. Chicken fat is the poultry fat most used for cooking purposes in the United States, as is natural, since chickens are the commonest table poultry. Goose fat, so well known in Europe, is used in this country chiefly by families of foreign birth or descent who keep to old food customs.

OLEOMARGARINE.

A discussion of animal fats would not be complete without some mention of oleomargarine, called "margarin" in Europe. The term margarin was at first used to designate a mixture of fats, composed of such proportions of palmitin and stearin that it closely resembled

margaric acid, for which it was often mistaken, and so it was given the name "margarin." Later, when soft beef fat, or oleo oil, became an important component of this mixture, it was called oleomargarine or oleo. The name does not at present, however, indicate the composition of the oleomargarine. The principal fats used in its manufacture in the United States are oleo oil, neutral lard (that is, a specially rendered lard), and cottonseed and other oils. All these ingredients must be pure and prepared with care in order that none of them shall have any marked taste or odor. These are mixed in such proportions as will give the final product a melting point very near that of butter. After being thoroughly mixed the fats are churned with a small quantity of milk and sometimes cream, the proportions of these used depending upon the quality of the product desired. In the preparation of high-grade oleomargarine varying quantities of butter are also added. The resulting product is then washed, salted, and worked as in ordinary butter-making processes. Owing to the ease with which a highly colored oleomargarine might be sold as butter, it is illegal to sell oleomargarine unless it is plainly labeled as such, and the practice of coloring it to imitate butter is discouraged by a heavy tax. Oleomargarine is not used as extensively in this country as in Europe, where it serves both for table and culinary purposes. If prepared from pure materials and under sanitary conditions, it is a wholesome fat, which, according to European investigators, is well assimilated. It has an energy value of about 3,500 calories per pound.

VEGETABLE FATS.

Vegetable fats are prepared on a commercial scale from oil-bearing seeds and fruits and must ordinarily be freed from disagreeable flavors and odors as well as from dirt, by-products, and harmful constituents. In general, the process involves cleaning the seeds or fruits and subjecting them to hydraulic pressure. Cold-pressed oils usually receive no further treatment. When the seeds or oily pulp are hot pressed, however, the raw oil is likely to contain free fatty acids and other organic compounds of a disagreeable nature which make refining necessary. The refining process is adapted to the properties of the oil in question.

OLIVE OIL.

Olive oil is obtained by subjecting the ripe olives to pressure. The best grade, known as virgin oil, is obtained from perfect olives of the proper degree of ripeness. Lower grades may be obtained either by crushing and pressing an inferior quality of olives or by a second pressing of the residue from the first pressing of the better grades of fruit. The only refining or purification of the better

grades of oil necessary is filtration to remove foreign matter. In the United States olive oil is used almost exclusively for table purposes, being a very common salad oil. In localities where it is produced, especially in southern Europe, it is used for cooking as well as for table purposes, owing to the larger and more readily available supply (especially of the cheaper grades) and to the relatively limited supply of animal fat in such regions.

COTTONSEED OIL.

Cottonseed oil in its crude form is obtained as a ruby or dark-red oil by subjecting the seeds of the cotton plant to great pressure. This crude oil was at first used for soap making and other industrial purposes, but with the increased demand for culinary fats improved methods of refining the crude oil, such as treating it with caustic alkali, fuller's earth, distillation with steam, etc., were developed. These serve to modify greatly the color, odor, and taste, and the best grade of table oil has a light-yellow color and a bland flavor. The refined oil was first utilized in the preparation of various lard substitutes by mixing with it hard animal fats to produce a substance having a consistency similar to lard. Other methods have been developed, and a wide variety of cooking fats prepared from cottonseed oil are now on the market. More recently salad oils have been prepared which are wholesome and palatable and are being used in increasing quantities for table purposes.

PEANUT OIL.

Peanut oil is not used to any extent for culinary purposes in this country, but some is imported for use as a salad oil. In Europe, where it is obtainable in relatively large quantities, it is used quite extensively both as a table oil and for cooking. When prepared by the cold-press method the characteristic peanut flavor is not noticeable and the product is bland and palatable. In the past the peanut oil produced in this country has been used in the crude state for industrial purposes, but an attempt is being made to develop the peanut-oil industry in this country and to encourage the more extensive use of the refined oil, which is now more expensive than cottonseed oil, but less expensive than olive oil of similar grade.

COCONUT OIL.

Coconut oil is prepared by pressing the dried meat of the coconut, which is known in the trade as copra. The crude oil is used for cooking purposes in tropical countries where the oil is prepared. In this condition the fat melts at about 70° F. and is a liquid in summer or in warm rooms during the winter. Refined coconut fat has little marked taste or odor if fresh and carefully prepared, and when solid

is white in color. It has only recently come into use for culinary purposes but bids fair to become an important cooking fat. There are a number of coconut-oil products on the market, but these are not much used for home cooking. They are extensively used in bakeries and similar establishments, one reason being that they can be obtained with a considerable range of hardness, so that they are useful for many special purposes. For instance, one of the coconut fats is combined with sugar for use as a filling for some sweet crackers.

CORN OIL.

Corn oil is prepared from the germ of the corn which is obtained as a by-product in the manufacture of cornstarch and glucose. The germs are ground and subjected to pressure which removes the oil. Some studies have been made of the use of corn oil for shortening purposes. Pastry made with mixtures of lard and corn oil in amounts not exceeding 10 per cent of the latter gave results identical with those in which lard alone was used.[1] When properly refined, corn oil is a wholesome product and is marketed to some extent as a table oil. Large quantities of the crude oil are used for industrial purposes.

MISCELLANEOUS OILS.

In addition to the above-mentioned vegetable oils there are a number of others, such as soy bean, sunflower, sesame, and colza or rapeseed oils, which may be mentioned here. When carefully prepared these oils are of a yellow color and bland flavor and are used for food purposes in those countries where the particular seeds are obtainable in large quantities and the supply of other edible oils is limited. Walnut and similar nut oils, produced in some countries where the nut crops are large, are of good flavor and find a use for salad purposes.

There is some attempt being made to promote the utilization for table purposes of oils expressed from the kernels of the stones of such fruits as the apricot, peach, and cherry. Inasmuch as these stones are available in quantity as a waste product of the drying and canning of fruits, and the expression and refining of the oil may be done at small cost, they offer an additional source of edible oil.

HARDENED VEGETABLE FATS.

Hardened vegetable oils, technically known as hydrogenated oils, which have much the same consistency as lard or butter, have been put on the market within recent years. They are commercial pe-

[1] Ann. Rpt. Ohio Dairy and Food Comr., 21 (1906), pp. 18–23.

sibilities owing to the fact that as a result of a long series of laboratory experiments processes have been discovered by which oils may be transformed into a product of any desired hardness by chemically adding hydrogen to them. This reaction takes place, for instance, when finely divided nickel, hydrogen, and the oil to be hardened are intimately mixed under proper conditions. The nickel does not enter into the composition of the hardened fat, but is removed and used repeatedly in the preparation of other batches. The hardened oils are generally white in color, have no appreciable odor or taste, and are less likely to become rancid than the original oil. A number of these fats, marketed under a variety of trade names, have proved popular and appear to be of quite wide application. This hardening process may also be of special value in the future utilization of some oils like the fish oils, which, because of objectionable flavors and odors, are not entirely suited for edible purposes in their natural state.

NUT BUTTERS.

Closely related to the nut oils mentioned above (see p. 13) are the nut butters prepared by grinding finely the meats of peanuts, almonds, or other nuts rich in fat, so as to produce an oily mass much like butter in consistency. Peanut butter is by far the most common of the nut butters. It is used chiefly as a filling for sandwiches, crackers, etc., though it finds some use in cooking. The nut butters can be made at home by grinding the whole nuts; a special nut-butter knife being furnished with some of the meat or food choppers. In addition to containing a large amount of fat, nut butters also contain considerable protein.

AVOCADO.

Although its oil is not extracted for food purposes, the avocado, commonly called the alligator pear, a tropical fruit which is becoming better known in some of our markets, contains as high as 20 per cent of fat in the edible portion. When used in the diet this must be taken into consideration as a source of fat.

THE SELECTION OF EDIBLE FATS.

In the selection of edible fats the principal considerations should be the purpose for which the fat is to be used, quality, price, and individual preference, since the energy which the body derives from different fats is about the same, and all are regarded as wholesome when of good quality. Custom, which influences to a considerable extent the choice of all foods, can, therefore, be subordinated to the more essential consideration of economy.

When purchasing fats for table use it should be remembered that they influence the wholesomeness of the foods with which they are served as well as the energy value and cost. The price of table fats depends largely upon their flavor and to a less extent on color, and in selecting them each housekeeper must decide how much she can afford to pay for these properties, since all the edible fats have practically the same energy value. In general it pays always to buy fats of such good quality that none will have to be thrown away through spoilage. In some instances a higher-priced article may be more economical in the end as, for example, clean, sanitary butter, as compared to a cheaper but less sanitary product. In some instances, where taste or flavor only is involved, a less expensive table fat may answer quite satisfactorily the purpose of a more expensive one. For example, the chief use of table oils is as an ingredient of salad dressings, and when a characteristic flavor is not especially desired, good grades of cottonseed and peanut oils, having a bland flavor, may be used, when these are less expensive than the corresponding grades of olive oil.

Fats used for shortening influence the appearance, flavor, texture, composition, keeping quality, and cost of the foods in which they are incorporated. In selecting shortening fats flavor and odor are to be considered, but attractive appearance and color are of less importance, since in cooking these are usually masked. Other qualities being equal, those culinary fats are more economical and desirable which possess the best keeping quality; that is, the least tendency to become rancid. Also, for general use shortening fats give the best results if they are neither too hard nor too soft to be easily mixed with the other ingredients of the dough at ordinary temperatures.

Fats used as a medium for cooking should be carefully selected, since they influence the flavor, appearance, and texture of the foods cooked in them, as is evident when one recalls the bad flavor imparted to fried foods by burned or rancid fat. Preference should be given to a fat which does not scorch too readily at the temperature most commonly used for frying. Experiments in the laboratory of the Office of Home Economics indicate that butter and lard scorch at a lower temperature than beef or mutton fats and cottonseed, peanut, or coconut oils. For this reason, therefore, the latter fats are preferable for deep frying, which requires high temperature.

Prejudice often exerts an influence on the selection of fats as well as other food materials, and these prejudices are often curious. For example, some persons who think that lard is not only indigestible, but also unwholesome, nevertheless enjoy bacon, which, of course, supplies pork fat in a different form. Such prejudices have little

or no basis of fact and should not exert too much influence on the selection of any food material.

ECONOMY IN THE USE OF FATS.

In minor details the practice of economy in the use of fats must vary according to conditions in different homes, and each housekeeper must determine for herself the manner in which economy may be secured in her own household. There are some general suggestions, however, which are worth consideration.

Economy in the use of table fats probably may best be secured by avoiding careless or needless uses. The quantities of butter, salad dressing, or table oils generally eaten by the different members of the family should be observed, and the size of the portions served governed accordingly, so that the left-overs will be small. One should serve all of these that a person will use, but no more. In some homes this possible economy is not considered sufficiently important to warrant the effort. In hotels and restaurants, however, where profit is increased by the prevention of unnecessary waste, this matter is given considerable attention, and careful observations have been made to determine the average quantity of butter eaten per person. It has been found that if too small a portion is served more second orders are called for, and much butter is thus wasted, because the total will so often exceed the person's desire for it. On the other hand, if the portions served are too large, a considerable quantity will be unused. As a result of such observations many hotels and restaurants have regulated the size of portions so as to give satisfaction and yet insure the smallest amount of waste. A common size is a block 1¼ inches by 1¼ inches by ½ inch (weighing about one-half ounce), which is readily obtained by cutting a pound print of butter into 32 pieces with a cutter designed for the purpose, or with a sharp knife slightly warmed. Many housekeepers prefer to make the butter into "butterballs," using for the purpose the wooden paddles which may be bought from house-furnishing stores. The size of the balls can be regulated according to the needs of the individual.

Where table fats (chiefly butter and cream) are used in cookery to give flavor, economy demands that they be so used as to secure the maximum of quality in texture or flavor from a minimum quantity of fat. It is a waste to use more than a good recipe calls for. It is well known that too much butter makes a cake soggy, while a salad dressing with too much oil tastes "fat." It is more economical to stir butter into cooked vegetables just before they are served rather than while cooking, and the flavor thus imparted is more pronounced. Furthermore, if added before cooking

much of the butter is lost unless the water in which the vegetables are boiled is served with them. Instead of adding butter to vegetables many people cook fat ham, bacon, or salt pork with them and relish the characteristic flavor thus imparted. As another example of the economical use of butter in cookery may be cited the frying (sautéing) of eggs, rice cakes, etc., in a mixture of butter, to contribute flavor, and some such fat as lard or drippings to give a sufficient quantity of fat for the cooking process. Also, part butter (or cream) and part lard is frequently used in shortening pie crust, biscuits, etc. A mixture of equal parts of carefully rendered beef suet, lard, and butter, known as "butterschmaltz," is used in some regions of the country for shortening purposes in place of table butter.

Since shortening fats are used to secure texture more often than for their distinctive flavor, it is possible to utilize a greater variety of fats for this purpose than for table use. Oftentimes a home-rendered fat may be economically substituted for butter, lard, or vegetable fats for shortening purposes. For instance, beef-brisket fat is softer than suet and, if well rendered, can be used to make gingerbread, spice cake, and similar dishes in which the spice or molasses used masks the flavor of the fat. A possible economy, more common some years ago than now, is the use of chopped, unrendered suet for shortening in such foods as suet puddings, or the use of finely chopped salt pork for a similar purpose in some spice cakes. Occasionally cheese can be used both as a shortening and to give flavor, as in making Brown Betty, cheese biscuits, etc., as is mentioned in another bulletin of the Department.[1]

The use of too much fat for shortening is not only extravagant but may be unhealthy, because the frequent ingestion of large quantities of very fat foods often produces digestive disturbances. All that a dish requires to be of standard quality should be used, but no more. It is just as possible for food to be overfat or overshort as it is to be oversweet, and in the preparation of cakes, batters, etc., recipes which call for an unusually large quantity of fat should be avoided for the sake of health as well as economy. Another possible economy is the selection of a food which requires little or no fat in its preparation in place of a similar kind of food rich in it, when some other ingredient of the meal supplies a generous amount of fat. For instance, sponge cake instead of pound cake, or beaten biscuit instead of butter cakes, might well be selected when very fat meats or other fat dishes form a part of the meal.

In frying, fat serves principally as a medium for transmitting the heat needed for cooking. The flavor is modified also, as is evident

[1] U. S. Dept. Agr., Farmers' Bul. 487.

from the fact that foods like croquettes when fried in fat have a different taste from those baked in the oven. Since all foods in frying absorb some fat, their nutritive (energy) value is increased. Up to a certain point this may be an advantage, but it is desirable to regulate the amount absorbed in order that the foods may be of good flavor and texture and not overfat. An excess of fat soaked up by the food is not only waste, but lowers the quality and may give rise to digestive disturbances in the case of some persons.

The temperature of the fat during deep frying has considerable influence upon the quantity of fat which the food absorbs, and some preliminary studies have been made in the laboratory of the Office of Home Economics to determine satisfactory temperatures. A doughnut batter was prepared from flour, egg, milk, sugar, and baking powder, and portions of uniform size and shape were fried for definite periods of time in beef fat, lard, cottonseed oil, coconut fat, and peanut oil at a number of different temperatures. It was found that there was a definite temperature for each fat at which the batter soaked the smallest quantity of fat and was most satisfactorily cooked as regards texture. This temperature was about 360° F. for beef fat, 350° F. for lard, and 390° F. for cottonseed, coconut, and peanut oils. Subsequent chemical analyses of the doughnuts showed that if this temperature were lowered 20° F. for the animal fats and 40° F. for the vegetable fats the quantity of fat absorbed by the doughnuts was increased approximately 25 per cent. Although these temperatures may vary somewhat with different lots of fat, owing to slight variations in composition, it may be stated in the light of these experiments that for successful deep frying vegetable fats should be heated from 30° to 40° F. higher than animal fats. Mixtures of beef or mutton fats with some of the oils and softer fats were also tested. With mixtures of equal amounts of hard and soft fats the optimum temperature was midway between that of the two separate fats. There is less danger of a fat being too hot than being too cold for frying foods, since a tendency for the food to burn is more easily noted by the cook than a tendency for it to soak fat. Also, if the fat is too cool more of it is absorbed by the foods. However, fats used for deep frying should never be heated high enough to scorch, as the burned flavor and odor are very hard to remove, and foods fried in scorched fats are of poor quality. A thermometer which will register as high as 420° F. is very useful for measuring temperatures in deep frying, but it is rather expensive, and a fairly close idea of the temperature may be obtained by noting the time taken to brown a 1-inch cube of bread completely immersed in the hot fat. Experiments in the laboratory of the Office of Home Economics indicate that vegetable fats are at the most satisfactory

temperature for deep frying when the bread is cooked to a golden-brown color in one-half minute or is well browned in one minute. Lard, beef, and, probably, mutton fats are hot enough when the bread is cooked to a golden-brown color in one minute or is well browned in one and one-half minutes.

In sautéing, or pan frying, the food is cooked on a layer of fat rather than completely immersed in it, as in deep frying, and for this reason there is less opportunity for the food to soak fat. There is more danger, however, that the food so cooked will be burned unless care is taken, since the pan may become too hot and the relatively small amount of fat may soon be used up and the food stick to the pan. For this reason a fat which does not scorch at a low temperature is especially desirable for sautéing; butter, for example, being less satisfactory in this respect than lard or beef fat. If the butter flavor is desired in pan-fried foods, a little butter can be used with a harder fat or the butter can be added after cooking. Otherwise great care must be exercised to avoid scorching.

UTILIZATION OF WASTE FATS.

In many homes the failure to utilize left-over or discarded portions constitutes the chief waste of fat. Many housekeepers who are economical in other ways do not give sufficient attention to this matter, and, as a result, there is apt to be more fat wasted than either protein or carbohydrate. In cities this is evidenced by the fact that there are large and profitably conducted concerns whose only business is the recovery and sale of grease from garbage. As this grease is always sold for soap making or other industrial purposes, it is not a complete loss, though lost to the housekeeper, and much of it, if properly saved in the home instead of thrown in the garbage, might have been used for culinary purposes. In country households there is often better opportunity for utilizing waste fats than in the city, and it is quite possible that some of the fat ordinarily fed to the pigs and chickens might be more economically utilized if the edible portions were carefully rendered and used for cooking purposes and the remainder used for soap making. The latter is not such a difficult process as many persons suppose. The necessary lye may be readily purchased at a low price, and simple directions for soap making usually come with it.

From the standpoint of economy it is desirable for the purchaser of meat to secure all the fat which he pays for in a particular cut. The dealer pays a flat rate per pound for the carcass, which includes the lean meat, fat, and bone. The fat must either be sold with the meat or else removed and the lean meat sold at a higher price to insure a profit. Many butchers in preparing beef, mutton, or pou-

try for delivery remove much of the fat in order to make the meat appear more attractive. The purchaser often does not take the trouble to ask for this fat, even though he may have paid for it at the same rate as the meat. If this fat were secured, as is frequently the case with the excess bone and trimmings which are used for soup making, it could often be rendered at home and used to supplement cooking fats. Sometimes very large and fat cuts of meat are sold at a relatively low price per pound. While the purchaser may think that thus a bargain is being secured, it is usually true after allowance has been made for a large quantity of fat and bone that the price paid for the lean portion is considerably higher than appears at first thought. In such cases it is especially desirable that the excess fat be utilized in the home.

If one so desires, bits of fat meat, portions of butter, etc., left over from the table may be saved, rendered (if necessary), clarified, and used for cooking. While there may seem to be some esthetic objection to this procedure, this is not necessarily a serious one under family conditions where good health prevails, since if properly rendered the fat is sterilized. The better way, however, is to effect the same saving by taking care in serving that each portion is approximately what will be eaten. Under commercial conditions the use of table left-overs is entirely unjustified, since the person served can know neither the circumstances under which they were obtained nor the quality of the material which he may eat. The pieces of excess fat trimmed before cooking from roasts, steaks, or chops should be saved as well as the drippings tried out in cooking. Drippings from fresh pork may be clarified and used like lard. Beef fat or drippings and small quantities of lamb fat, if fresh and carefully clarified, may be added to lard or other soft fats for deep frying. Sausage, ham, and bacon fats may be used as they are for frying and warming up foods, since the characteristic flavors which they impart are relished by many.

In some parts of the country fat is used (but less now than formerly) to preserve meats for a limited time. The thoroughly cooked meats are placed in clean earthen jars or wooden tubs, and over them is poured a sufficient quantity of hot melted lard or beef suet to cover. The hot fat sterilizes the surface of the meat and on cooling forms a protective coating against the action of the air, bacteria, or mold spores. So far as is known this method has not been tested experimentally, but meat so treated is said to keep very well, providing it is thoroughly cooked and the fat has been heated sufficiently to sterilize it and drive off the water. To prevent the fat from becoming rancid it is desirable to store the jars in a cool, dark place. Carefully rendered beef suet or mutton tallow may also be

used in the place of paraffin, which it closely resembles in consistency, to seal the tops of jelly glasses. To cite another instance, a spoonful of salad oil may be poured on top of the liquid in an opened bottle of pickles or olives. This excludes air and so helps to keep the material in good condition until used.

RENDERING AND CLARIFYING FATS.

Beef or mutton suet and scraps of fat contain more or less muscle or connective tissue, which must be removed by rendering before the fat is available for most culinary uses. The household method of rendering generally consists in cutting the material into small pieces and heating it in an open kettle until the fat has separated out quite completely from the particles of tissue, which usually have become shriveled and browned. This tissue (called "scraps" or "cracklings") is then removed by straining, being pressed to remove the fat more completely. The scraps or cracklings are utilized in various ways in different parts of the country, being sometimes eaten as such and sometimes used as shortening. Some housekeepers prefer to render their fat with the addition of water, since they believe there is less danger of burning. However, this necessitates heating the strained fat until the water is driven off to secure a fat of good keeping quality.

The following method of rendering fats, found to be very satisfactory in the laboratory of the Office of Home Economics, may be applied in the home. The fat is cut finely with an ordinary household meat chopper or sausage grinder and is then heated in a double boiler until completely melted. The melted fat is then strained through a rather thick cloth (medium fine huckaback, for instance) to remove the finely divided bits of tissue. The advantage of this method is that since the material to be rendered is finely divided the fat separates readily from the inclosing tissue at a temperature very little above its melting point, and there is no danger of scorching it as in the older open-kettle method. This is of importance, since recent information shows that fats overheated in rendering do not keep as well as those which have not been heated too high. Also, there is no odor of scorched fat in the room during rendering. After the fat is rendered it should be carefully heated to make sure that it is free from moisture, and sterilized. This method of rendering fat is entirely satisfactory when the quantity of fat to be rendered is fairly small. The difficulty of using it on a large scale would depend chiefly upon the labor and cost of grinding the fat, for if a double boiler of sufficient size were not available one could be improvised by setting the kettle containing the fat in a larger kettle containing water. Pieces of wood or other material should be placed

on the bottom of the outer kettle to insure a layer of water between the two kettles and prevent the fat from becoming too hot.

Fats which have been saved when meats are cooked, or which have been salvaged in some other way, must usually be clarified—that is, freed from objectionable odors, tastes, or colors—before being entirely satisfactory for culinary purposes. A common custom is to cook a slice of potato in the fat, and this may help if the fat is fairly satisfactory to start with. A fairly successful household method for clarifying fats is as follows: Melt the fat with at least an equal volume of water and heat for a short time at a moderate temperature, with occasional stirring. Let the mixture cool, remove the layer of fat, and scrape off any bits of meat and other material which may adhere to the under side. Rendering or clarifying fat with milk gives quite satisfactory results in modifying odors and flavors. The procedure is as follows: To 2 pounds of fat (finely chopped if unrendered) add one-half pint of milk (preferably sour). Heat the mixture in a double boiler until rendered or thoroughly melted, stir well, and strain through fairly thick cloth. When cold the fat forms a hard, clean layer, and any dark material adhering to the under side of the fat may be scraped off. Sour milk, being coagulated, is preferable to sweet milk, since the curd remains on the cloth through which the rendered mixture is strained and is thus more easily separated from the rendered fat, which has acquired some of the milk flavor and butter fat.

Undesirable odors and flavors can be decreased in intensity or removed, if not too pronounced, by heating the fats with a good grade of charcoal, and the method is applicable to fats which could not be satisfactorily treated by the method first spoken of. To each pound of chopped, unrendered fat add 12 pieces of clean, hardwood charcoal about the size of a walnut and render the fat in a double boiler, as described above. Allow the charcoal to remain in the ·ted fat for about two hours and stir the mixture occasionally. It . .ecessary to strain the fat through flannel or other closely woven cloth to remove all the fine particles of charcoal. Rancid odors, if not too pronounced, may be satisfactorily removed by this method. If the odor is very pronounced more charcoal is needed, and the mixture requires longer heating. It is interesting to note that the characteristic yellow color of the beef fat may be removed and a white, odorless fat secured.

SAVORY FATS.

Savory fats—that is, fats to which have been added some strong seasoning material, such as sage, marjoram, summer savory, or thyme—offer a satisfactory method of utilizing fats having pro-

nounced odors or flavors like those of beef or mutton. The specific flavoring bodies present in these seasoning materials are dissolved in the fats and mask the strong original flavors. Savory fats are useful for frying, warming up vegetables, etc., since they impart a distinct flavor to foods.

There are a number of recipes for the preparation of savory fats. The following have been tested and found to be satisfactory with mutton or beef fats:

SAVORY FAT, I.

To 1 pound of unrendered fat (chopped fine) add 1 slice of onion about ¼ inch thick and 2 inches in diameter, 1 teaspoon broken bay leaves, 1 teaspoon salt, and about ⅛ teaspoon pepper. Render in a double boiler and strain.

SAVORY FAT, II.

To 1 pound unrendered fat (chopped fine) add 2 teaspoons thyme, 1 slice onion about ¼ inch thick and 2 inches in diameter, 1 teaspoon salt, and about ⅛ teaspoon pepper. Render in a double boiler and strain.

SAVORY FAT, III.

To 1 pound unrendered fat (chopped fine) add 1 teaspoon thyme, 1 teaspoon marjoram, ½ teaspoon rubbed sage, 1 teaspoon salt, and about ⅛ teaspoon pepper. Render in double boiler and strain through fine cloth.

If it is desired to prepare a savory fat from a rendered fat the above recipes may be modified by melting the fat, adding the seasoning in the same proportion as above, heating the mixture gently for an hour or more, and straining. The following recipe has also been recommended for preparing a savory fat from a rendered fat:[1]

To 1 pound rendered fat (melted) add 1 sour apple, 1 onion, and 1 teaspoon ground thyme or other sweet herbs tied in a small cloth. Cook together in oven or on the back of the stove until the onion and apple are well browned. Strain the fat through a fine cloth.

The kind and amount of seasoning recommended may be easily modified to suit one's taste. Potato chips and French fried potatoes cooked in each of the above fats were found to have no noticeable mutton or beef flavor. In order to remove all particles of the herbs added it is necessary to strain the savory fats through flannel or other closely woven cloth.

SOFTENING HARD FATS TO MAKE THEM MORE SATISFACTORY FOR SHORTENING PURPOSES.

Fats, like beef or mutton suet, which are too hard for satisfactory use in shortening, may be softened to the desired consistency by mixing softer fats like lard or cottonseed oil with them. The follow-

[1] U. S. Dept. Agr., Farmers' Bul. 526 (1915), p. 9.

ing recipes have been found to be satisfactory in preparing a soft culinary fat from these hard fats:

SOFT FAT, I.

Grind together two parts unrendered beef or mutton fat and one part lard. Render in double boiler as described on page 22.

This fat is improved by adding ½ pint of milk to each 2 pounds of the mixture before rendering. The flavor is thus improved, and the fat may be used for frying or shortening.

SOFT FAT, II.

Mix three parts unrendered beef or mutton fat (ground fine) and one part refined cottonseed oil. Render in double boiler as described on page 22.

Rendered beef or mutton fats may be softened by adding to them the lard or cottonseed oil, heating the mixture until melted, and mixing thoroughly. It is desirable to stir these mixed fats occasionally while cooling to avoid the danger of the hard fat separating out. The beef and mutton flavors are lessened somewhat by this softening process.

CARE AND STORAGE OF FATS IN THE HOME.

The chief precaution to be taken in storing fats is to prevent them from becoming rancid. The exact nature of the chemical changes undergone by fats when they become rancid is not definitely known. It is certain, however, that rancidity does not occur without the previous formation of free fatty acids, and for the formation of fatty acids light, heat, and air (containing oxygen) are necessary. Therefore, fats to be stored for some time should be protected from heat, light, and air. In the case of table fats like butter, which usually are not kept long in the home, it is only necessary to keep them in a cool place and away from objectionable odors and flavors, which they absorb quite readily. The common custom of keeping butter in a clean earthen dish in the ice compartment of the refrigerator is probably the most satisfactory for the average housewife. The rural custom of keeping it in a pail suspended in a deep well or on a cool and dry, clean cellar bottom is also satisfactory. Table oil, from which small quantities are used frequently, keeps best if stored in a cool place like a refrigerator and kept in small closed containers so as to exclude the air as much as possible. Bottles of dark glass, or wrapped in light-proof paper, have an advantage over clear glass bottles in that they exclude the light. Tin cans are also very satisfactory for this purpose.

More care is necessary in the storage of cooking fats than is the case with table fats, because the former are generally purchased in larger quantities and are kept longer. While it is not necessary to

seal these fats as tightly as is the case with canned fruits, they should, nevertheless, always be kept in covered receptacles and in a cool, dark place. Also, fats like lard should contain (or more accurately inclose) very little moisture, since this favors the growth of molds. In warm weather scraps of fat to be saved should be rendered promptly to prevent them from becoming rancid. In cold weather they may be kept until a sufficient quantity has accumulated to make rendering worth while.

SUMMARY.

Economy of fats in the home may be secured by intelligent selection, economical use, and by the prevention of unnecessary waste. For intelligent selection, which means choosing the fat best suited for the purpose in question, a knowledge of the properties and prices of the different fats on the market is necessary. It should be remembered that the energy value of all the pure fats is practically the same, and the housekeeper must determine how much she can afford to pay for particular flavors or appearance, on which the difference in price largely depends. To secure economy fats should be used primarily for the purposes to which they are best adapted, and the extravagant use of both table and cooking fats should be avoided. To prevent unnecessary waste fats should be carefully handled and stored so that none need be discarded through spoilage. Furthermore, all scraps of fat which accumulate in the home should be saved and used for culinary purposes wherever possible, thus lessening the amount of money expended for cooking fats. It should always be borne in mind that while an economical use of fat is to be desired, stinting is to be avoided. In determining how far economy in the use of fats is to be practiced one should bear in mind that true economy is possible only where the value of the time and energy involved in the saving or utilizing of an article is less than the value of the articles saved.

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1090 *Opinion.*

United States District Court, Southern District of New York.

PROCTER & GAMBLE COMPANY, Complainant,

against

BERLIN MILLS COMPANY, Defendant.

Kerr, Page, Cooper & Hayward, Solicitors for Complainant. Alfred M. Allen, Livingston Gifford and Thomas B. Kerr, Counsel.
John C. Pennie, Solicitor for Defendant. Marcus B. May and John C. Pennie, Counsel.

AUGUSTUS N. HAND, *District Judge:*

This suit is for infringement of patent No. 1,135,351, granted to the complainant as assignee of John J. Burchenal on April 13th, 1915. The application for the patent was filed November 10th, 1910. The specification states that the invention is for a food product consisting of a vegetable oil, preferably cottonseed oil, partially hydrogenized and hardened to a homogeneous white or yellowish semi-solid closely simulating lard.
Claims 1 and 2 alone are in issue and read as follows:

"1. A homogeneous lard-like food product consisting of an incompletely hydrogenized vegetable oil.

"2. A homogeneous lard-like food product consisting of
1091 incompletely hydrogenized cotton-seed oil.

The special object of the invention is, according to the specification:

"* * * to provide a new food product for a shortening in cooking in which the liability to become rancid is minimized and in which the components of such vegetable oils which are inferior and detrimental to use as such a food product have been to a large extent converted into a higher and more wholesome form. All such vegetable oils contain glycerids of unsaturated fatty acids and among these notable quantities of fatty glycerids of lower saturation than olein. It is the presence of these glycerids of lower saturation that seriously affects the rancidity of the material. Oxidation is largely the cause of rancidity which oxidation weakens the fat at the point of absorption at the double bonds, and these glycerids of lesser saturation readily absorb oxygen from the air at ordinary temperatures while the more highly saturated glycerids, as olein, only absorb oxygen at elevated temperatures. It is evident, therefore, that oils or fats containing notable quantities of glycerids of linolic acid or of lesser saturation are distinctly inferior as an edible product to those containing a minimum of these glycerids with a larger per cent of olein. On the other hand while it is important to get rid of the

readily oxidizable glycerids of lower saturation, it is also important not to supply too large a percent of fully saturated glycerids.

1092 "* * * In manufacturing this product cotton-seed or other vegetable oil is caused to chemically absorb a limited amount of hydrogen by reacting on the oil with hydrogen in the presence of a catalytic agent and at an elevated temperature. The oil is preferably agitated in a closed vessel in the presence of an atmosphere of compressed hydrogen, a catalyser of finely-divided nickel carried by kieselguhr being maintained in suspension in the oil and its temperature being raised to about 155° C.

"According to the present invention, the amount of hydrogen absorbed is carefully regulated and limited. In practice, the operation is stopped when the oil has been converted into a product which cools to a white or yellowish semi-solid more closely resembling lard than do the commercial mixtures of cottonseed oil and animal oleostearin while in many respects the product is superior to the best leaf lard as a shortening. It is not so liable to become rancid and the product can be heated to a considerably higher temperature than lard without smoking or burning. The high temperature to which my product can be raised without smoking or burning makes the product ideal for frying, inasmuch as a crust forms almost instantly on the food fried, which prevents any absorption of the shortening. A lard-like product thus prepared from cottonseed oil has a saponification value of about 195 and an iodin value ranging from about 55 to about 80. The product having an iodin value of 55 has

1093 a titer of about 42° and a melting point of about 40° C., the having an iodin value melting point of about 40° C. that having iodin value of 80 has a titer of about 35° and a melting point of about 33° C. While but partially hydrogenized, containing from about 1.5% to 2.5% of additional hydrogen more than in the non-hydrogenized material, it shows no free cottonseed oil when subjected to the Halphen test, thereby differing from all commercial lard substitutes containing this oil. It contains from twenty to twenty-five per cent of fully saturated glycerids, from five to ten per cent linolin, and from sixty-five to seventy-five per cent olein; and an average of a number of samples gives twenty-three per cent. of saturated fats, seven and five-tenths per cent linolin and sixty-nine and five-tenths per cent olein, while the cottonseed oil before treatment contained seventeen per cent saturated fats, thirty-seven per cent linolin and forty-six per cent olein. It will thus be seen that I have produced an ideal food product which is high in olein, low in linolin and lesser saturated fats and with only enough stearin to make the product conceal at ordinary temperatures."

The complainant urges that Burchenal first taught the art that a partially hydrogenated vegetable oil, preferably cottonseed oil, was edible and was a useful lard substitute. It contends that prior to Burchenal's conception it was not known that hydrogenated cottonseed oil was edible and that the only processes then in use aimed at complete saturation and produced a hard non-edible product. It

fore discussing the prior art, I would say in general that Nor-
1094 mann, whose patent will later be referred to, had already disclosed a method of hydrogenating oils, and had set forth in his specification that the process was progressive and involved "no secondary reaction." The method of adding cottonseed oil to beef stearin for use as a lard compound was well known and much used, as it still is. The hydrogenation of cottonseed oil resulted in a reduction of the fluid and substitution of the solid fats. Normann's patent, as well as various experiments of scientists, indicated that the addition of hydrogen to cottonseed oil would result in the reduction or elimination of the fluid and substitution of solid or partially solid fats. No one has shown that the product resulting from such hydrogenation was ever non-edible or unsanitary in any respect.

The British patent No. 10,783 (1887), to Joseph Sears was for a lard substitute composed of refined unbleached cottonseed oil and a fat adapted to give a stiffness to the compound corresponding substantially to that of refined lard. The specification provided that the temperature should be raised sufficient to melt the fat or stearin, the heated ingredients mixed and then chilled rapidly so as to prevent crystallization and separation. This general process was well known in the art before the date claimed for the invention of Burchenal and indeed is referred to in the patent in suit. A very large market for such lard-like compounds exists at the present time and has existed many years past.

The British patent No. 1515 of 1903 to Normann discloses a process for the reduction of glycerines resembling that of the patent to Burchenal. Normann's patent says that:

1095 "The property of finely divided platinum to exercise a catalytic action with hydrogen * * * is already known * * *. Recently Sabatier and Sendersens of Paris have discovered that other finely divided metals will also exercise a catalytic effect on hydrogen, viz., iron, cobalt, copper and especially nickel."

"By causing acetylene, ethylene or benzene vapour in mixture with hydrogen gas to pass over one of the said metals (which had just been reduced in a current of hydrogen) the said investigators obtained from the unsaturated hydrocarbons, saturated hydrocarbons, partly with simultaneous condensation."

"I have found that by this catalytic method it is easy to convert unsaturated fatty acids into saturated acids."

"This may be effected by causing fatty acid vapours together with hydrogen to pass over the catalytic metal, which is preferably distributed over a suitable support such as pumice stone. It is sufficient, however, to expose the fat or the fatty acid in liquid condition to the action of hydrogen and the catalytic substance."

"For instance, if fine nickel powder obtained by reduction in a hydrogen current, is added to chemically pure oleic acid, the latter heated over an oil bath and a strong current of hydrogen is caused to pass through it for a considerable time, the oleic acid may be completely converted into stearic acid."

"The quantity of the nickel thus added and the temperature are

immaterial and will only affect the duration of the process.

1095 Apart from the formation of small quantities of nickel soap, which may be easily decomposed by dilute mineral acids, the reaction passes off without any secondary reaction. The same nickel may be used repeatedly. Instead of pure oleic acid, commercial fatty acids may be treated in the same manner. The fatty acid of tallow which melts between 44 and 48° C. has an iodine number 35.1 and a yellow colour will after hydrogenation melt between 56.5 and 59°, while its iodine number is 9.8 and its colour slightly lighter than before, and it will be very hard."

"The same method is applicable not only to free fatty acids, but also to the glycerines occurring in nature, that is to say, the fats and oils. Olive oil will yield a hard tallow-like mass; linseed oil and fish oil will give similar results."

"By the new method, all kinds of unsaturated fatty acids and their glycerides may be easily hydrogenized."

The Normann patent clearly discloses that oils may be completely hydrogenized, that the process is progressive and that it involves "no secondary reaction," in other words, that cottonseed oil which starts edible remains so. The experiments and articles of Paal and Roth, which were alluded to at the trial, show that hydrogenization of oils including cottonseed oil was understood in the prior art.

Such being the state of the art, Edwin Cuno Kayser wrote Procter & Gamble from England that he had a process of consid-

1097 erable value and would like to talk to them about it; thereafter he came to America about November, 1907, bringing samples of hydrogenized cottonseed oil. He showed these to Burchenal, the superintendent of Procter & Gamble. As a result of his visit he made an arrangement under a preliminary contract of January, 1908, to experiment upon the hydrogenized cottonseed oil as a substitute for lard. The first project was apparently to use hydrogenated cottonseed oil as a compound to be added to a percentage of beef stearin and cottonseed oil. Burchenal says he had done no work in connection with hydrogenizing cottonseed oil before he saw Kayser. He testified that:

"Mr. Kayser went out to our factory and made sketches as to the apparatus that would be necessary to carry on this work and the apparatus was ordered at once; a little plant was installed for experimental purposes and I think it was ready to operate sometime in January or February, 1908." (Deposition of Burchenal, p. 11.)

The defendant succeeded in obtaining contemporaneous memoranda as to some of Kayser's experiments from the records of Procter & Gamble. The first experiment was as follows:

"Fat hardening Process by E. C. Kayser.

"First experimental lot was complete Jany. 17th, 1908. Fat treated —Summer Yellow Cottonseed Oil. Used Nickel Sulphate and Kieselghur as described. Experiment was conducted by Mr. Kayser alone. He claims to have used about 1% Nickel Metal and 2% Kieselghur.

1098 "M.P. of fat after 3 hrs. 55½° C.
"M.P. of fat after 6½ hrs. 60.3° C.
"Dr. Bendler reports as follows:
"Melting point of fat 60.3° C.
"Hydrocarbons, .33%.
"Iodine value of fat, 7.14%.
"The fat does not contain free fatty acids. This material is much superior to the samples from J. Grossfield & Sons which showed an iodine value of 52.26 and melting point of 39.3° C. (The laboratory sample melted at 49.9° C.) Their samples contained 5.12% free fatty acids and 2% hydrocarbons.
"Mr. Kayser reports as follows: 'The melting point of fatty acid, prepared from first lot of hardened cottonseed oil is 62° C. This is several points higher than I ever got before. Presumably the composition of your oil differs somewhat from that of the oil I handled formerly.'"

Another experiment by Kayser of the date of March 5, 1908, was also obtained from the Procter & Gamble records in which the following melting points appeared:

5 hrs. at ordinary pressure 42° C.
1½ hrs. at 60 lb. pressure 43° C.

VonPhul testified that Kayser told him in 1907 that he was getting up a patent for a food product and even Burchenal's own testimony shows that Kayser supposed that the product he was making was edible. If Kayser at first told him it was not edible he did so when they were negotiating and he wished to keep his process in the dark until he had arranged his terms. That Kayser's
1099 statement that it was not edible was not taken seriously by either party is shown by the following testimony.

"Q. 887. But you did not know as a matter of fact whether it would be edible or not? A. I did not. Mr. Kayser stated that it would not be—but that was his method of talking."

Both of these men were proceeding soon after Kayser's arrival in this country to develop hydrogenated cottonseed oil as a food product. Even if the thought first occurred to Burchenal I cannot see that he did anything to carry it out in practice. Kayser's patent No. 1,004,035, application for which was filed March 20, 1908, discloses the process which was employed to make the product covered by the patent in suit, and the specification of this Kayser patent contains the statement that "The time of treatment will vary with the progress realized and with the degree of saturation aimed at." It is to be remembered that Burchenal distinctly disclaimed in his testimony that he had anything to do with the invention of the process covered by the Kayser patents and we thus have a situation where Kayser invented the process and developed the product to the point where it was applicable to use as a food product. He came to America with a sample which as appears from the written record taken from the files of the complainant had a melting point of only

39 and developed other samples with melting point of 42° and 43° in his March 5, 1908, experiments.

Moreover, it is to be remembered that Crossfield has em-
1100 ployed Kayser to experiment in hydrogenation oil, that the former had been in close communication with Normann who had patented only four years before the process I have mentioned, and that Crossfield had so strenuously objected to the use by Procter & Gamble of the processes of Kayser that they were obliged to purchase their rights in them. It is also noteworthy that Kayser refused to testify in this case and that the witnesses as to the work of Kayser in America are officers or employees of the complainant. Under such circumstances the meagerness of the evidence which has been adduced to show that Burchenal had anything to do with the development of the lard-like food product which is the subject of the patent in suit, coupled with his admission that the entire process under which it was made was the work of Kayser is most significant and makes it impossible to find that Burchenal invented anything. The defendant has been embarrassed in its defence by many difficulties and has been obliged to go into the enemy's camp to secure almost all the ammunition. In spite of this, it has established that Kayser at the very beginning has developed not only a process but a product little differing from Crisco. Kayser remained with Procter & Gamble until well into 1910 and did not leave America until about July of that year. While there is some general evidence of what Burchenal and others did, or directed, I can find no real proof that anyone but Kayser did anything of substantial moment. No step was taken by Burchenal that could possibly amount to invention.

Complainant urges that the experiments of Kayser and the
1101 patents of Normann and Kayser aimed at complete saturation and that neither realized the importance of a partially hydrogenized product. But the process under which their products were made involved in its progress partial hydrogenation, and Kayser's patent No. 1,004,035 distinctly stated that "The time of treatment will vary with the progress realized and with the degree of saturation aimed at." Kayser as far as I can see did everything that was done to develop Crisco, and if his work fell short of this he achieved enough so that the final step was inevitable to one skilled in the art. Kayser's process was the complainant's process and his product involved a progressive reaction fitted for any purpose. The broad discovery as between him and Burchenal certainly belongs to him.

Furthermore under any fair interpretation of the patent there is no infringement. The file wrapper indicates that the examiner rejected the claims as originally filed, saying:

"* * * if the problem of simulating lard from cottonseed oil were presented to an oil chemist, an incomplete hydrogenization of the cottonseed oil would at once suggest itself to him as a solution of the problem. All the claims are accordingly rejected on the * * * ground of lack of invention."

Thereafter new claims were rejected upon the Kayser patents for the reason that his process could be arrested at any time to produce an incompletely hydrogenized product. Then and for the first time

Burchenal filed an amendment setting forth certain percent-
1102 ages of linolin olein and stearin which his product should contain. It seems quite evident therefore that Claims 1 and 2 of his patent would under such circumstances, if valid at all, be limited to substantially the chemical composition described in the amended specification. Indeed the specification closes with the statement that the inventor has produced a product which "is high in olein, low in linolin and lesser saturated fats and with only enough stearin to make the product congeal at ordinary temperatures."

Under such circumstances it is impossible to treat the melting point as practically the determining factor and if this is not done the defendant's product Kream Krisp does not infringe. After the examiner had held that an incomplete hydrogenation would suggest itself to any chemist seeking to simulate lard and rejected the claims on Kayser, the patentee, as I have shown amended by specifying a particular product and dwelling upon the advantages of a small percentage of linolin to avoid rancidity. If, therefore, the inventor contributed anything to the art it was this special chemical composition which his patent discloses. Claims 1 and 2 should consequently be construed in the light of the proceedings of Burchenal before the Patent Office and not given a scope which would monopolize an art in which Normann, Kayser and others had been the real pioneers.

Kream Krisp has a chemical composition extremely remote from that described in the specification of Burchenal. The following are the relative percentages:

1103

	Burchenal—per cent.	Kream Krisp—per cent.
Saturated fats	20-25	28
Olein	65-75	34.3
Linolin	5-10	37.7

Thus it appears that Kream Krisp instead of being low in linolin is extremely high, and that instead of being high in olein as specified in the Burchenal patent, it has a percentage of olein which differs but little from that existing in refined cottonseed oil unhydrogenated. In fact Kream Krisp seems to present many of the objections referred to in Burchenal's specification and to lack the very things upon which the latter based his right to receive a patent. Indeed the composition is much closer to the lard compound Jewel made out of stearin and cottonseed oil than to Crisco.

The bill should be dismissed with costs because the patent is void for lack of invention and for the further reason that claims 1 and 2 if properly construed are not infringed by the defendant.

Dated, October 3, 1917.

A. N. H.
D. J.

1104 *Decree.*

United States District Court, Southern District of New York.

In Equity. No. —. No. 13-100. On Patent 1,135,351.

PROCTER & GAMBLE COMPANY, Plaintiff,

vs.

BERLIN MILLS COMPANY, Defendant.

Final Decree.

This cause having come on to be heard upon the pleadings and proofs, after hearing Livingston Gifford, Esq., and Thomas B. Kerr, Esq., in behalf of the plaintiff, and John C. Pennie, Esq., and Marcus B. May, Esq., in behalf of the defendant, and the cause having been considered by the court, and an opinion having been filed herein on October 3, 1917; now therefore, it is hereby

Ordered, adjudged and decreed:

1. That the Burchenal patent in suit, No. 1,135,351, is void for lack of invention;

2. That claims 1 and 2 of said patent are not infringed by the defendant; and

3. That the bill of complaint be and the same is dismissed, with costs to the defendant to be taxed by the clerk of the Court.

AUGUSTUS N. HAND,
United States District Judge.

Approved as to form.
THOMAS B. KERR,
Of Counsel for Pl'tf.

New York, N. Y., October 10, 1917.

1105 *Petition on Appeal.*

District Court of the United States, Southern District of New York.

In Equity. No. 13-100.

PROCTER & GAMBLE COMPANY, Plaintiff,

vs.

BERLIN MILLS COMPANY, Defendant.

The plaintiff, Procter & Gamble Company, conceiving itself aggrieved by the decree entered herein on October 10, 1917, does hereby

appeal thereform to the United States Circuit Court of Appeals for the Second Cicuit, for the reasons specified in the Assignment of Errors which is filed herewith; and it prays that this appeal may be allowed and a Citation granted, directed to Berlin Mills Company, commanding it to appear before the United States Circuit Court of Appeals for the Second Circuit, to do and receive what may appertain to justice to be done in the premises; and that a transcript of record, proceedings and papers upon which said decree was made may be duly authenticated and sent to the United States Circuit Court of Appeals for the Second Circuit.

PROCTER & GAMBLE COMPANY,
By KERR, PAGE, COOPER & HAYWARD,
Its Solicitors.

The foregoing petition of appeal is allowed this 1st day of November, 1917.

AUGUSTUS N. HAND,
U. S. District Judge.

1106 *Assignment of Errors.*

United States District Court, Southern District of New York.

In Equity. No. 13–100.

PROCTER & GAMBLE COMPANY, Complainant,

vs.

BERLIN MILLS COMPANY, Defendant.

The plaintiff, Procter & Gamble Company, conceiving itself to be aggrieved by the decree entered on the 10th day of October, 1917, now appears by its solicitors and presents, with the accompanying petition of appeal from said decree, the following assignment of errors:

First. The court erred in holding that the patent in suit No. 1,135,351 was void for lack of invention.

Second. The court erred in holding that claims 1 and 2 of the patent in suit No. 1,135,351 were not infringed by the defendant.

Third. The court erred in dismissing the bill of complaint with costs to the defendant.

Fourth. The court erred in not awarding to plaintiff a decree sustaining said patent No. 1,135,351 as for a patentable invention.

Fifth. The court erred in not holding that claims 1 and 2 of the patent in suit No. 1,135,351 were infringed by the defendant.

1107 Sixth. The court erred in not entering a decree in favor of plaintiff awarding it an injunction and an account of damages and profits and costs against the defendant.

Seventh. The court erred in refusing to enter a decree in favor of the plaintiff for the relief prayed for in the bill of complaint.

By KERR, PAGE, COOPER & HAYWARD,
Solicitors for Plaintiff.

Dated, New York, November 1st, 1917.

1108 *Citation.*

District Court of the United States, Southern District of New York.

In Equity. No. 13–100.

PROCTER & GAMBLE COMPANY, Plaintiff,

vs.

BERLIN MILLS COMPANY, Defendant.

UNITED STATES OF AMERICA, *ss:*

To Berlin Mills Company, Greeting:

You are hereby cited and admonished to be and appear at a session of the United States Circuit Court of Appeals for the Second Circuit, to be held at the United States Court House and Post Office Building, Borough of Manhattan, New York, N. Y., on the first day of December, 1917, pursuant to an appeal filed in the clerk's office of the District Court of the United States for the Southern District of New York, wherein Procter & Gamble Company is appellant and you are appellee, to show cause, if any there be, why the order entered against said appellant, as in the said appeal mentioned, should not be corrected, and why speedy justice should not be done to the parties in that behalf.

1109 Witness the Honorable Augustus N. Hand, Judge of the District Court of the United States for the Southern District of New York, this 1st day of November, in the year of our Lord One thousand nine hundred and seventeen and of the Independence of the United States the One hundred and forty-second.

AUGUSTUS N. HAND,
U. S. District Judge.

Service of the foregoing citation is admitted this 2nd day of November, 1917.

BERLIN MILLS COMPANY,
By JOHN C. PENNIE,
Its Solicitor.

1110 *Bond.*

District Court of the United States of America for the Southern District of New York, in the Second Circuit.

PROCTER & GAMBLE COMPANY, Plaintiff-Appellant,

against

BERLIN MILLS COMPANY, Defendant-Respondent.

Bond on Appeal.

Know all men by these presents, that Procter & Gamble Co., of ——— ———, as principal, and National Surety Company, a corporation under the laws of the State of New York, with its principal place of business at No. 115 Broadway, in the City, County and State of New York, as surety, are held and firmly bound unto the above named Berlin Mills Co., in the sum of Two Hundred and Fifty ($250.00) Dollars to be paid to the said Berlin Mills Co., for the payment of which well and truly to be made, said principal and surety bind themselves, their heirs, executors, administrators and assigns, jointly and severally, firmly by these presents. Sealed and dated the 1st day of November, 1917.

Whereas, the above named Procter & Gamble Co. has prosecuted an appeal to the United States Circuit Court of Appeals for the
1111 Second Circuit, to reverse the decree rendered in the above entitled suit, by a Judge of the District Court of the United States for the Southern District of New York.

Now, therefore, the condition of this obligation is such, that if the above named Procter & Gamble Co. shall prosecute said appeal to effect, and answer all costs if it fail to make its plea good, then this obligation shall be void, otherwise the same shall be and remain in full force and virtue.

NATIONAL SURETY COMPANY,
By H. E. EMMETT,
Resident Vice-President.

Attest:
E. M. McCARTHY,
Resident Assistant Secretary.

Affidavit, Acknowledgment and Justification by Guarantee or Surety Company.

STATE OF NEW YORK,
County of New York, ss:

On this 1st day of November, 1917, before me personally came H. E. Emmett, known to me to be the Resident Vice-President of National Surety Company, the corporation described in and which executed the foregoing Bond of Procter & Gamble Co. as surety and

who, being by me duly sworn, did depose and say that he resides in the City of New York, State of New York; that he is the Resident Vice-President of said Company, and knows the corporate seal thereof; that the said National Surety Company is duly incorporated
under the laws of the State of New York, that said Company
1112 has complied with the provisions of the Act of Congress of August 13, 1894, that the seal affixed to the within Bond of Procter & Gamble Co., is the corporate seal of said National Surety Company, and was thereto affixed by authority of the Board of Directors of said Company, and that he signed his name thereto by like authority as Resident Vice-President of said Company, and that he is acquainted with E. M. McCarthy and knows him to be the Resident Assistant Secretary of said Company; and that the signature of said E. M. McCarthy subscribed to said Bond is in the genuine handwriting of said E. M. McCarthy, and was thereto subscribed by order and authority of said Board of Directors, and in the presence of said deponent; and that the assets of said Company, unencumbered and liable to execution exceed its debts and liabilities of every nature whatsoever, by more than the sum of Eight Million dollars.

H. E. EMMETT,
(Deponent's Signature.)

Signed, sworn to, and acknowledged before me, this 1st day of November, 1917.

CHAS. J. KOCH,
Notary Public, etc.

I approve of the within bond, and of the sufficiency of the sureties thereon.

AUGUSTUS N. HAND,
D. J.

1113 *Præcipe.*

United States District Court, Southern District of New York.

In Equity. No. 13-100.

PROCTER & GAMBLE COMPANY, Plaintiff,

vs.

BERLIN MILLS COMPANY, Defendant.

To the Clerk of the United States District Court for the Southern District of New York:

You are hereby requested to certify the transcript of record to be filed in the United States Circuit Court of Appeals for the Second Circuit pursuant to an appeal from a final decree herein allowed to the plaintiff on the 15th day of November, 1917, and to include in such transcript of record the following papers:

1. The pleadings, and the proofs taken in open court, including the exhibits offered in connection therewith.

2. Defendant's Exhibit D, depositions de bene esse.

3. Defendant's Exhibit Book.

4. The opinion of Judge A. N. Hand, filed on or about October 3, 1917.

5. The final decree entered on or about October 10, 1917.

6. The petition of appeal and allowance of same, dated November 1, 1917.

7. The assignment of errors, dated November 1, 1917.

8. The citation issued November 1, 1917, and served upon defendant's solicitor on November 2, 1917.

9. The appeal bond, approved November 1, 1917.

10. This præcipe.

11. Certificate of the Clerk.

Dated, New York, November 15, 1917.

KERR, PAGE, COOPER & HAYWARD,
Solicitors for Plaintiff.

I hereby acknowledge service of a copy of the foregoing præcipe this 15th day of November, 1917.

JOHN C. PENNIE,
Solicitor for Defendant.

United States District Court, Southern District of New York.

In Equity. No. 13-100.

THE PROCTER & GAMBLE COMPANY, Plaintiff,

vs.

BERLIN MILLS COMPANY, Defendant.

Order Waiving Equity Rule 75.

Upon motion of Kerr, Page, Cooper & Hayward, solicitors for plaintiff, it is

Ordered that the provision of Rule 75 of the Rules of Practice in Equity in regard to stating the testimony of witnesses in narrative form be waived, and that the testimony be reproduced in the exact words of the witnesses.

Dated, February 20, 1918.

J. M. MAYER,
United States District Judge.

The entry of the above order is hereby consented to.

KEER, PAGE, COOPER & HAYWARD,
Solicitors for Plaintiff.

JOHN C. PENNIE,
Solicitor for Defendant.

1116 *Stipulation.*

United States District Court, Southern District of New York.

PROCTER & GAMBLE COMPANY, Complainant-Appellant,

vs.

BERLIN MILLS COMPANY, Defendant-Appellee.

It is hereby stipulated and agreed, that the foregoing is a true transcript of the record of the said District Court in the above entitled matter as agreed on by the parties.

Dated March 4th, 1918.

KERR, PAGE, COOPER & HAYWARD,
Attorneys for Complainant-Appellant.

JOHN C. PENNIE,
Attorney for Defendant-Appellee.

1117 *Clerk's Certificate.*

UNITED STATES OF AMERICA,
Southern District of New York, ss:

PROCTER & GAMBLE CO., Complainant-Appellant,

vs.

BERLIN MILLS CO., Defendant-Appellee.

I, Alexander Gilchrist, Jr., Clerk of the District Court of the United States of America for the Southern District of New York, do hereby certify that the foregoing (in 2 vols.) is a correct transcript of the record of the said District Court in the above-entitled matter as agreed on by the parties.

In testimony whereof, I have caused the seal of the said Court to be hereunto affixed, at the City of New York, in the Southern District of New York, this 4th day of March, in the year of our Lord one thousand nine hundred and eighteen and of the Independence of the said United States the one hundred and forty-second.

[SEAL.] ALEX. GILCHRIST, JR.,
Clerk.

1118 United States Circuit Court of Appeals, for the Second Circuit, October Term, 1918.

No. 10.

Argued October 10, 1918. Decided November 13, 1918.

PROCTER & GAMBLE COMPANY, Complainant-Appellant,

v.

BERLIN MILLS COMPANY, Defendant-Appellee.

Appeal from the District Court of the United States for the Southern District of New York.

Before Ward, Rogers and Hough, Circuit Judges.

Appeal from a Decree in Equity Entered in the District Court for the Southern District of New York.

The action is upon Claims 1 and 2 of Patent No. 1,135,351, issued April 13, 1915, to the plaintiff herein as assignee of John J. Burchenal, who is and long has been an officer of the corporate plaintiff. The claims are as follows:

"1. A homogeneous lard-like food product consisting of an incompletely hydrogenized vegetable oil.

2. A homogeneous lard-like food product consisting of incompletely hydrogenized cottonseed oil.

1119 The Court below held in substance:

1. The disclosure did not amount to invention;

2. If there was invention Burchenal was not the inventor; and

3. Upon a proper construction of the claims in suit there was no infringement.

The bill was accordingly dismissed and the plaintiff took this appeal.

Livingston Gifford, for Plaintiff-Appellant.
John C. Pennie, for Defendant-Appellee.

HOUGH, *C. J.*:

(1) The patent declares that

"this invention is a food product consisting of a vegetable oil, preferably cottonsed oil, partially hydrogenized and hardened to a homogeneous white or yellowish semi-solid, closely simulating lard."

This is a description of a visible, tangible thing which for some years has been manufactured and sold by plaintiff; as to which there is no evidence that anybody else ever made it before, or that if this product is entitled to patent protection there is any closely related prior art.

Invention is denied first, on the ground once taken by an Examiner in the Office, namely that "if the problem of simulating lard from cottonseed oil were presented to an oil chemist, an incomplete hydrogenation of the cottonseed oil would at once suggest itself to him as a solution of the problem." That is, (*a*) the matter is said to be so obvious as not to rise to the dignity of invention.

1120 Another objection is, that hydrogenation of vegetable oils was not new; and the discovery long prior to this application of catalysts not belonging to the "royal" group of metals had paved the way to effective and comparatively inexpensive hydrogenation. (Patent to Normann, British, No. 1515 of 1903.) Prior to Burchenal's effective date it is admitted that the hydrogenic saturation of oil by catalytic means had been practiced at least in well known laboratories, and a hard fat produced, solid at ordinary temperatures and showing on analysis a very large percentage of stearic or palmitic acid. It is obvious that if one starts with (e. g.) cottonseed oil, which is liquid at ordinary temperatures, because it has too little solid fat in it, and by chemical means so changes the molecular composition or arrangement of the substance as to increase the ratio of solid fat (i. e. unites enough hydrogen with linolin and olein to produce stearin) and thus produces the hard fat commonly known as stearin;—there must have been a time during the development of the process when the union of hydrogen had only progressed far enough to convert the liquid into a semi-solid.

Therefore, it is said (*b*) that no man is entitled to a patent upon the thing or product which has always been produced when the process of making another thing or product was (say) half done.

The third objection to invention is substantially this:—the merit or value of what Burchenal claims and what this plaintiff makes and sells, is that it looks like lard, acts like lard and can be used for the purposes of lard without offending the conservatism of cheap housewives and maid-servants. But before Burchenal many imitation lards were made by mechanically mixing hard animal fats and cottonseed oil in varying proportions, and some of these mixtures show on analysis substantially the same chemical characteristics as are shown by Burchenal's chemically produced "homogeneous semi-solid." Therefore it is said that to make the same thing as had been made by earlier lard imitators but in a different way

1121 cannot warrant a patent upon the resulting thing or product, whatever may be true in respect of the process by which that product is reached. This is as much as to say (*c*) that the Burchenal article when completed and ready for use must be old, because other men had earlier arrived at the same chemical result by other paths.

Objection (*a*) raises the question of fact encountered in a large proportion of patent causes, and concerning which discussion is of

small value if the record discloses no one who ever tried to do the same thing in the same way. When novelty in that sense appears the question really is one of measuring foresight by hindsight. The problem seems easy now, but when the object reached was desirable, useful and apt for commercial success, the bald fact that nobody ever did it before is persuasive, though not conclusive evidence of some invention. Burchenal's imitation lard has these attributes, and we consider it a sufficient answer to the statement that any oil chemist could have done the thing, to note that no oil chemist did do it during the more than score of years prior to Burchenal's application when cottonseed oil (especially) as an abundant American product was endeavoring to supplant lard in the American market.

The next objection to invention (*b*) really denies, the possibility of invention ever residing in noting or discovering a use for something which, if not a by-product, may be termed a half-product or unfinished product of an existing method of procedure. Without resorting to the extreme doctrine of Potts vs. Creager, 155 U. S., 597, it seems to us that the question presented by this record depends upon whether the thing produced by partial hydrogenation is a different thing from that which existed before hydrogenation begun and that which would exist when it ended. The change introduced by catalytic introduction of hydrogen is chemical; the analysis of the cottonseed oil at divers stages of the process of manufacture differs. To be sure, the difference is only in the union of additional atoms of hydrogen with the unsaturated fats (linolin and
1122 olein); but if this molecular and chemical change induces a resulting change in appearance, in utility and in texture, it may well be called, when lard-like, a thing different from what it was as oil, and equally different from what it would be at the point of saturation.

The patent law does not speak in terms of science, though scientific evidence is necessary for the application of its rules. The chemical composition of steam, water and ice is the same, but they are different things, and in the same commonsense way oil, lard and stearin are different things, although (with some chemical latitude) the oil may be said ultimately to become stearin, and to pass through the lard stage on the way.

For substantially the same reasons we think there is nothing in the last (*c*) objection to invention. It may be assumed as true that by the mixture of cottonseed oil and animal stearin a substance can be produced which for practical purposes is the same thing as Burchenal's chemically changed cottonseed oil; but one is a mixture and the other is not, and assuming the difference to be unimportant from the standpoint of either chemist or cook, it is a vital difference from that of the law.

We are therefore of opinion that there was invention in Burchenal's disclosure. Product patents may be justly subjected to critical scrutiny, but these claims are far within the border line adverted to in Fonseca vs. Suarez, 232 Fed. Rep., 155; and just as the conversion of an abandoned machine into an operative and successful

one by the introduction of new but simple features constitutes invention (United Shirt Co. vs. Beattie, 147 Fed. Rep., 736), so we think that seizing upon thing A, which had been thing B, and was to become thing C, and utilizing the half-made but different product amounted to an invention which is duly set forth in this application.

(2) The finding below, that Burchenal was not the inventor of whatever invention is revealed, is really a declaration that
1123 one Kayzer did the inventing, and Burchenal for some inexplicable reason appropriated it. This is an affirmative defence and must be sustained by a fair preponderance of credible evidence. Burchenal swore to invention in the statutory form, and the presumption of validity extends to the identity of the inventor for certainly nothing could be more completely invalid than a patent for invention to one who invented nothing.

The train of evidence resulting in the finding of non-invention in Burchenal is this:—the plaintiff corporation is and long before 1907, was a large manufacturer of soap. Down to that time it neither made nor dealt in food products, fatty or otherwise. In that year it received from England a letter from one Kayser saying that he intended coming to the United States to introduce "a new process of the greatest possible importance to soap manufacturers," and asking substantially for employment or remuneration if he was to communicate his valuable knowledge. He was employed, he divulged his process; it is a process for the hydrogenation of vegetable oils, and is one of the processes which when arrested (say) half way, produces Burchenal's "homogeneous lard-like product."

By the time this action was begun Kayzer had returned to England (in 1910) and on or shortly after the outbreak of the present war was interned as an enemy alien.

While in this country he had assigned to the plaintiff herein his applications for patents on processes of hydrogenation, had been paid for them, and become a stockholder in the plaintiff corporation. The defendants sent an agent to England, who interviewed Kayzer and sought to extract from him evidence that he, and not Burchenal, either discovered or invented the food product before this court. Kayzer refused all evidence, and in effect declined to either assert or assent to the proposition that he was the deviser or inventor of what Burchenal got a patent for.

There is no evidence that, during the whole period of Kayzer's employment by the plaintiff and his experimentation upon
1124 fats, he either attempted to produce a "lard-like compound" or observed that such compound was obtainable by his process. There is some evidence (if it can be called by that name) that after Kayzer had carried on experiments at plaintiff's factory for some time he showed to the deposing witness a fat "like tallow," looking as if it had been "moulded in a jelly glass," and that Kayzer said in substance that "it was for cooking purposes." What Kayzer showed may be regarded as evidence, but upon what principle the remarks of one who is neither a party nor a witness can be regarded as competent, we do not perceive.

Yet in this testimony there is nothing inconsistent with the course of events as plainly proven. When Kayzer began to produce by his processes a hard fat, it occurred certainly to Mr. Procter (the plaintiff's President) and not improbably to Kayzer himself, that since substantially saturated cottonseed oil was a fair commercial equivalent for animal stearin, that since frying and shortening compounds were largely manufactured by combining animal stearin with cottonseed oil, so they might be made by mechanically mixing liquid oil and hardened oil. Such experiment was tried, not at the factory of plaintiff, which had no machinery for the purpose, but at the establishment of one McCaw, who was already a manufacturer of lard-like compounds employing animal fat.

We are satisfied of the truth (entirely apart from all presumptions) of defendants' testimony that it was not until Kayzer had returned to England, or was on the point of going, that it occurred to anyone that it was not necessary to first harden by hydrogenic saturation the cottonseed oil and then mix it with the fluid article in order to make a lard-like compound;—but that the hardening process might be arrested in the manner and for the purposes disclosed by Burchenal's application.

Assuming now that this mental operation or discovery in the sense of the patent law (Walker on Patents, 5th ed., Sec. 2) amounted to invention, we not only find no evidence that
1125 Burchenal was not the inventor, but it is a strain upon credulity to believe that when this plaintiff corporation might just as well have advanced an application in Kayzer's name it deliberately preferred the fraud of prosecuting it in that of Burchenal.

It may be, and we think is, quite true that the evidence reveals Burchenal as not primarily a chemist, but a man of business deeply interested in the advancement of his corporation's prosperity. We recognize the fact that there is a fundamental difference between "new articles of manufacture and new articles of commerce" (Cerealine, etc. Co. vs. Bates, 101 Fed. Rep., 272); and it may also be quite true that Burchenal's contribution to the sum of human knowledge grew out of the trained business man's observation of the possibilities of a chemist's process, which he was himself quite incapable of devising.

But just as it is immaterial whether a patentee "understands or correctly states the theory or philosophy of the mechanism which produces" his new result (Van Epps vs. United, etc. Co., 143 Fed. Rep., 869) so it is immaterial whether when Burchenal observed and seized upon as a new and useful thing a half hydrogenically saturated oil he was actuated rather by commercial instinct than acquired chemical knowledge. It is enough that he had both a mental conception and a tangible reduction to practice (Corrington vs. Westinghouse, etc. Co., 178 Fed. Rep., at 715) and that is all that the patent law requires. Quite possibly this patentee would never have conceived the thought, had he not watched Kayzer, but he could and did get something out of Kayzer's train of phenomena, which the latter neither thought of, nor reduced to practice.

(3) The final objection to a decree in plaintiff's favor is that properly construed the claims in suit are not infringed because (a)

the defendant's product widely varies from that of the patent in the relative percentages of saturated fats, olein and linolin,
1126 (b) the process pursued by defendant in disclosed or assumed in the patent in suit, and (c) that said claims are to be regarded as strictly limited, if not substantially abandoned, through or by reason of the proceedings in the Patent Office as revealed by file wrapper contents.

As to the first point (*a*) it is enough to note that while the variation insisted upon is true, it must to negative infringement be at least a variation extending beyond the limits of a valid claim read in the light of the disclosure.

In this instance it is not denied that what the defendant makes and sells is not only lard-like, homogeneous in the sense of mixtureless, and wholly consisting of an incompletely hydrogenized cottonseed oil, but it is within the limits of iodin-value, titer and melting points specified in the application. Therefore it is an infringement.

It is true (*b*) that defendant's process of manufacture is very different from that of plaintiff, and we are willing to assume it different from and better than anything known to Burchenal or developed by Kayzer. But this patent is upon a product, and i the product complained of is the patented article substantially as described, it makes no difference by what path or process, new or old, inferior or improved, the infringing product is manufactured. (General Electric Co. vs. Laco-Phillips Co., 233 Fed. Rep., 95.)

The contention (*c*) that the Office proceedings were such as to limit or nullify the broad claims in suit amounts we think to this, viz: when this application was filed in 1910 applicant demanded two claims which if anything are slightly narrower than the two now in suit. They were rejected by the primary Examiner and thereafter many changes were made in the language of the claims submitted by way of amendment. In our opinion never at any time did the applicant acquiesce in the Examiner's action, but consistently endeavored to obtain, and finally did obtain in the claims first above quoted, what he had in the first place asked for.

It is the acquiescence of an applicant and not the action of an Examiner or of many Examiners that surrenders to the public
1127 what the applicant first declares to be patentable invention. The very word "acquiescence" necessarily implies obedient action, perhaps enforced, but still submission on the petitioner's part. Here there never was any such acquiescence, and the patent as issued substantially contains in the claims in suit the originally propounded definition of invention. This is far within the rule enforced by us in Kinnear, etc. Co. vs Wilson, 142 Fed. Rep., 970, where a rejected claim was carried into and obtained grant in another patent. Here the claims rejected were at last substantially victorious in the same patent,—apparently through a change in the examining personnel.

For the reasons stated the decree appealed from is reversed with costs both here and below, and the cause remanded with directions to enter a decree adjudging Claims 1 and 2 valid and infringed.

1128 United States Circuit Court of Appeals for the Second Circuit, October Term, 1918.

No. 10.

Argued October 10, 1918. Decided November 13, 1918.

PROCTER & GAMBLE COMPANY, Complainant-Appellant,

v.

BERLIN MILLS COMPANY, Defendant-Appellee.

Appeal from the District Court of the United States for the Southern District of New York.

Before Ward, Rogers and Hough, Circuit Judges.

WARD, *Circuit Judge* (dissenting):

I think the District Judge was right in holding the patent void for lack of invention. It was well known that a vegetable oil could be changed chemically into a hard fat by hydrogenation and of course that at some stage of the process before complete hydrogenation it would be a homogeneous semi-solid. It was also known that the process would not affect the edibility of the product. The product at all stages of the process was therefore old and open to the public for any use of which it was capable. To apply it when
1129 semi-solid as a substitute for animal lard in cooking was no doubt novel and useful but was not in my opinion invention. To one skilled in the chemical art such a use was as obvious, if he thought about it at all, as were the many mechanical improvements which, though new and useful, have been held not to be inventions because within the capcaity of those skilled in the particular art. There was nothing revolutionary about this new use. There was no crying need or any problem to be met. The market was and still is abundantly supplied with mixtures of vegetable oils and animal fats which satisfactorily meet culinary needs. Yet the complainant is given a monopoly of all semi-solid homogeneous hydrogenized vegetable oils, however produced, when applied to culinary purposes.

1130 United States Circuit Court of Appeals for the Second Circuit.

THE PROCTER & GAMBLE COMPANY, Appellant,

v.

BERLIN MILLS COMPANY, Appellee.

Petition for Rehearing and Appendix, Including Opinion of the Court and Dissenting Opinion.

John C. Pennie, Marcus B. May, Counsel for Appellee-Petitioner.

United States Circuit Court of Appeals, Second Circuit. Filed Dec. 20, 1918. William Parkin, Clerk.

1131 *Brief Statement of Contents.*

1. The errors of fact and of law herein pointed out are substantial and are controlling in defendant-appellee's favor.

2. The errors in fact are in respect of matters on which the evidence is uncontroverted.

3. In finding infringement, the Court said:

"In this instance it is not denied that what the defendant makes and sells is not only lard-like, homogeneous in the sense of mixtureless, and wholly consisting of an incompletely hydrogenized cottonseed oil, but it is within the limits of iodine-value, titer and melting points specified in the application. Therefore, it is an infringement."

These holdings, upon which the Court bases its conclusion of infringement, are, as we believe, severally errors of fact (with the sole exception of the finding as to the melting point of defendant's product)..... Page. 1-6

Contrary to the findings of the Court the evidence shows:

(*a*) Defendant's product is not "lard-like", but is almost identical with the commercial mixtures essentially disclaimed in the patent 6-15

(*b*) Defendant's product is not "homogeneous in the sense of mixtureless" 16-21

(*c*) Defendant's product is not one "wholly consisting of an incompletely hydrogenized oil" 21-24

(*d*) Defendant's product does not have an iodine value within the limits specified in the patent 24; 10

(*e*) Defendant's product does not have a titer within the limits specified in the patent 25; 10

4. The remaining tests, specified in the patent, for determining the identity of the patented product, do not seem to be

referred to in the opinion of the Court (except as to the proportions of glycerides which the Court correctly indicates are not found in defendant's product), 1132 although the patentee has included them in his patent and cannot be heard to deny their controlling materiality. Defendant's product is outside of these remaining tests, and that fact might well have been included in the opinion of the Court as a basis for a judgment of non-infringement. (Matheson v. Campbell, 78 Fed., 910, 917.) 11-14

5. Prior Art Products described 14-16

6. The Court seems to have held that the patented product, regardless of its chemical and physical composition, is patentable because made by the addition of hydrogen rather than by the compounding of the constituent glycerides by physical admixture; thus basing the patentability of the product upon the process instead of novelty as a composition of matter 26-28

7. The Court seems to have held that defendant's product is an infringement of the patent in suit because produced by the adding on of hydrogen to cottonseed oil, i. e., because of the process employed by the defendant in the manufacture of its product; and in so doing, the Court has left out of consideration that defendant's product being substantially identical with the commercial mixtures of the prior art, is an old composition of matter, and therefore cannot be looked upon as an infringement of the patent 26-28

8. The appellant's brief contained misstatements of fact unsupported by quotation of evidence or reference to the record, that may well have misled the Court in its findings. We cannot but believe that the correction of some of these misstatements, which was attempted in appellee's brief, escaped the full consideration of the Court 20

9. The Court erred in not holding as a matter of law that the patent is invalid for want of invention. (The Wood Paper Patent case, 90 U. S., 566; Cochrane v. Badische, 111 U. S., 293.) 26-28

10. Opinion of the Court ..... Appendix 1
Dissenting opinion ..... Appendix 10

11. The Burchenal Patents ..... Appendix

1133 United States Circuit Court of Appeals for the Second Circuit.

In Equity. Patent No. 1,135,351.

THE PROCTER & GAMBLE COMPANY, Appellant,

v.

BERLIN MILLS COMPANY, Appellee.

Petition for Rehearing.

To the Honorable the Judges of the United States Circuit Court of Appeals for the Second Circuit.

Your petitioner, The Berlin Mills Company, defendant-appellee in the above entitled cause, respectfully petitions your Honorable Court for a rehearing of the appeal herein, that your petitioner may show the Court, as it believes it can do, that, on the record, the Court should find that the patent in suit is invalid and in any event is not infringed, and that the decree of the District Court should be affirmed.

As grounds for this petition, your petitioner says:

I. The Court in its decision made a finding of facts in respect of defendant's product, which is unsupported by, and contrary to, the undisputed evidence, and which if corrected would, your petitioner believes, result in a finding of non-infringement.

II. The Court in respect of infringement, stated a correct rule of law which, if it had followed in respect of the validity of the patent in suit, would, your petitioner believes, have resulted in finding the patent to be invalid.

1134 III. In preparing and presenting the original argument on the question of infringement, your petitioner was impressed with the condition that by reason of the proceedings in the Patent Office, and the amendments to the specification setting forth that it was the object of the patentee "in the preparation of my new lard-like composition * * * to obtain a product with a high percentage of olein, a low percentage of linolin, etc.", claims 1 and 2 would be held to embody only a product having this identifying test. When the Court held that this identifying test formed no part of claims 1 and 2, one may reasonably suppose that the Court considered that the argument in support of non-infringement of claims 1 and 2 disappeared with it, especially as the Court said in its opinion:

"* * * It is not denied that what the defendant makes and sells is not only lard-like, homogeneous in the sense of mixtureless, and wholly consisting of an incompletely hydrogenized cottonseed oil, but it is within the limits of iodine value, titer and melting points specified in the application. Therefore it is an infringement" (p. 8, App.).

What your petitioner now wishes is the opportunity to present an argument and the affirmative evidence in support thereof, to show that defendant's product does not infringe claims 1 and 2 as the Court has now construed them, and that the Court's finding in respect of defendant's product contains material and substantial errors of fact.

The uncontroverted evidence, to which reference will be herein made, shows:—

Defendant's product is not "lard-like" in the sense in which that term is employed and clearly defined in the patent in suit, quite irrespective of the file wrapper contents.

Defendant's product is not "homogen-ous in the sense of
1135 mixtureless", for although it is physically homogeneous, it consists of a mixture of free cottonseed oil and hydrogenized oil, and is not chemically homogeneous.

Defendant's product does not "wholly" consist of "an incompletely hydrogenized cottonseed oil." On the contrary, it consists in part of unhydrogenized cottonseed oil and in part of hydrogenized cottonseed oil, which are mixed or blended together.

Defendant's product is not within the range of iodine value (55 to 80) specified in the patent—but is 94.7 (Richter, p. 572, Q 13), and therefore far outside of that range.

Defendant's product, which has a titer of 33.85° C. (Richter, p. 572, Q. 13), is not within the range of 35° C. to 42° C. specified in the patent.

All of these errors are fundamental and are controlling in supporting defendant-appellee's contention of non-infringement.

IV. The error of law.

While the Court said:

"if the product complained of is the patented article substantially as described, it makes no difference by what path or process new or old, inferior or improved, the infringing product is manufactured" (p. 9, App.).

yet in considering the patented article, the Court said:

"It may be assumed as true that by the mixture of cottonseed oil and animal stearin a substance can be produced which for practical purposes is the same thing as Burchenal's chemically changed cottonseed oil; but one is a mixture, and the other is not, and assuming the difference to be unimportant from the standpoint of either chemist or cook, it is a vital difference from that of the law" (pp. 4, 5, App.).

thereby applying a different rule to govern infringement from that applied to govern anticipation and validity; whereas the same rule is applicable to both.

1136 V. The Court, out of many tests set forth in the patent, has selected the following, to wit:

(a) Lard-like;

(*b*) Homogeneous in the sense of mixtureless;

(*c*) Wholly consisting of an incompletely hydrogenized cottonseed oil;

(*d*) Iodine value;

(*e*) Titer;

(*f*) Melting point.

The Court has disregarded other tests which the patentee has included, namely:

(*g*) Saponification value;

(*h*) Composition or percentage of saturated glycerides, olein and linolin;

(*i*) Percentage of added hydrogen;

(*j*) Responsiveness to Halpen test to show the presence of free cottonseed oil; and

(*k*) Liability to become rancid.

The patentee has set the boundaries of his invention and has taken much latitude in so doing. He is supposed to have gone to the extreme—to have exercised his privilege to the full. Whatever characteristics may exist, he is bound by those he gives. What this Court has said in Matheson v. Campbell, 78 Fed., 910, 917, is here particularly apt and is repeated:

"Now, there are many tests that may be applied to two bodies which are being compared in order to determine whether they are or not identical. The number of these tests may be multiplied indefinitely, for the skill, the experience, the scientific ingenuity of the chemist, will ever devise new ones in the future as they have the old ones in the past. Some of these tests will be of great significance; some, almost crucial; others will be of but minor importance. Their relative value, no doubt, may change as science goes sweeping on from point to point; but it must be sound law, as it is reasonable common sense, to hold that the tests of prime importance in a suit for infringement are those which the patent itself prescribes. The inventor cer-
1137 tainly may be assumed to know what it is that he has invented. If any one is able to describe the product of his inventive skill, it is himself. He surely knows the earmarks of the thing he seeks to patent, and when, out of the multitudinous qualities which his product may exhibit under varying conditions and in different relations, he has selected and set forth in his patent a chosen few, surely these should be accepted as the distinguishing earmarks—characteristic stigmata of the product his patent is to cover. It may be that, after it is found that the body under investigation responds to all the tests of a patent, science may yet be able to demonstrate by other tests that, nevertheless, it is not the new product therein pat-

ented; that the patentee had selected identifying tests broader than he was entitled to, and which would cover products not within the range of his discovery. But, when the body under investigation fails to respond to the specific tests the patentee has himself selected, he certainly cannot fairly insist that it is identical with his product."

Placed in parallel columns, the identifying characteristics of the patented article as fixed by the patentee himself, and of the defendant's article, show grave discrepancies. There is no evidence that these discrepancies are immaterial. Indeed, the patentee cannot be heard to deny their materiality.

	Burchenal product.	Defendant's product.
Iodine Value	55 to 80	94.7
Melting Point	33°C. to 40°C.	35.7°C.
Titer	35°C. to 42°C.	33.85°C.
Saponification Value	195	194.5
% Saturated Fats	20 to 25	28
% Olein	65 to 75	34.3
% Linolin	5 to 10	37.7
Added Hydrogen	1.5% to 2.5%	.875%
Shows cottonseed oil by Halpen test	No	Yes
"Lardlike"	Yes	No
Liability to grow rancid like commercial mixtures	No	Yes

1138 From the foregoing tabulation it will be noted that the discrepancies are to every reliable characteristic or test.

Referring now to the particular tests selected by the Court.

VI. "Lardlike." It is indisputable that claims 1 and 2 contain at least one common identifying test, because both state that the product of the patent in suit must be "lardlike."

Lard is a word with a positive meaning; it is the substance produced by rendering the fat of the hog. "Lardlike" is a word with a variant meaning. A product may resemble lard very closely, or it may resemble lard remotely, and in both cases may not improperly be called "lardlike." It is the range of this elastic word so circumscribed in the patent in suit as to make it a definitely applicable test to determine whether, aside from other considerations, a product is within the monopoly of the patent?

As used in the patent "lard-like," of course, does not mean lard in the sense that it is the product of the hog, because none of these lard substitutes are obtained from hog fat.

"Lardlike" does not mean a product having a certain melting point because all these materials hav*ing* substantially the same melting point.

"Lardlike" is not distinguishing in the sense that the products are used in frying or cooking because all these products are used in the

same way, and for the same purpose and produce the same results when used.

The word "lardlike" is however quite clearly defined and circumscribed in the patent in suit. The patent contains this statement:

"This invention is a food product consisting of a vegetable oil, preferably cottonseed oil, partially hydrogenized and hardened to a homogeneous white or yellowish semi-solid closely simulating lard" (p. 1, l. 9.).

1139 The patent then states in what respect the product of the patent, which of course is the only product the patent protects, closely simulates lard, namely, that it is one.

"more closely resembling lard than do the commercial mixtures of cottonseed oil and animal oleo-stearin" (p. 1, l. 92).

Manifestly a product which does not more closely resemble lard than do the commercial mixtures of cottonseed oil and animal oleo stearin, no mater by what path or process, old or new, inferior or improved, it is produced, is not the "lard-like" product of the patent.

This proposition may be thus re-stated:

The testimony shows, without contradiction, that if we had samples of—

A—Lard.
B—Prior art products.
C—Product of the Patent.
D—Defendant's product.

and submitted them to a chemist, asking him what they were, he would reply:

A looks like lard, feels like lard, has the consistency of lard. Its melting point is 42°C.; its iodine value ranges from 46 to 70; its titer is 39°C. to 40°C.

It is probably lard, but whether it is lard produced by rendering from the fat of the hog or synthetically we cannot tell without knowing the process.

B looks like lard, feels like lard, has the consistency of lard. Its melting point is 42°C.; its iodine value is 95; its titer is 36°C.

It is not true lard, but resembles lard in some respects remotely.

C looks like lard, feels like lard, has the consistency of lard. Its melting point is 33°C. to 40°C.; its iodine value is 55 to 80; its titer is 35°C. to 42°C.

It is not true lard, but resembles lard much more closely than does B.

1140 D looks like lard, feels like lard, has the consistency of lard. Its melting point is 35.7°C.; its iodine value is 94.7; its titer is 33.85°C.

It is not true lard and though it resembles lard, it does so more remotely than B. does.

Tabulating these figures we have:

	Melting point.	Iodine value.	Titer.
A Lard	42°C.	46 to 70	39°C. to 40°C.
B Prior Art	42°C.	95	36°C.
C Patent	33°C. to 40°C.	55 to 80	35°C. to 42°C.
D Deft	35.7°C.	94.7	33.85°C.

If now we apply the specific test enumerated in claims 1 and 2, viz: "lardlike," as originally defined in the specifications, viz: "more closely resembling lard than do the commercial mixtures of cotton-seed oil and animal oleo stearin," we should find that if B does not anticipate the patent then D does not infringe it.

If, further, the chemist reports that, in composition, C, like A, has not over 10 per cent of linolin and has upwards of 48 per cent of olein (Richardson, p. 569, Q. 132); and D, like B, has upwards of 37 per cent linolin and not over 34.3 per cent olein, then we should find, as we would expect, that, C closely resembles A, and D and B are alike in remotely resembling A.

Now, defendant's product has all the stigmata and characteristics of the commercial mixtures and differs from the patented "lardlike" product in every reliable test of identification set forth in the patent. In fact, defendant's product is essentially disclaimed in the patent.

By certain tests set forth in the patent, the patented product does closely resemble lard, but by these same tests defendant's product not only does not closely resemble lard, but is substantially identical with the prior art mixtures and therefore is not "lard-like."

(a) The consistency of commercial lard is not a natural attribute of the lard, but is due to the commercial after treatment to
1141 which it is subjected and by which the solid and liquid glycerides are uniformly distributed throughout the mass. This is true of the product of the patent, although the patent contains no directions for the after treatment.

Mr. Burchenal (the patentee):

"Q. 491. Does the product which is withdrawn from the hydrogenating apparatus after being subjected to the process described in your specifications of the letters patent in suit, have this appearance?

"A. No; no, that which comes from the apparatus is liquid, hot, and would more correspond to the appearance of the lard when it was heated.

"Q. 492. And without further treatment, when it is permitted to cool, does it have this lardlike appearance which you describe?

"A. It depends entirely upon how it is cooled. It has to be subjected to the ordinary treatment for such material.

"Q. 493. What is that treatment?

"A. Run over a lard roll.

"Q. 494. What else?

"A. Well, it is subjected to the ordinary process, in all cases, a filtration, a deodorization, and then run over a lard roll.

"Q. 495. And the product as it comes from the process described

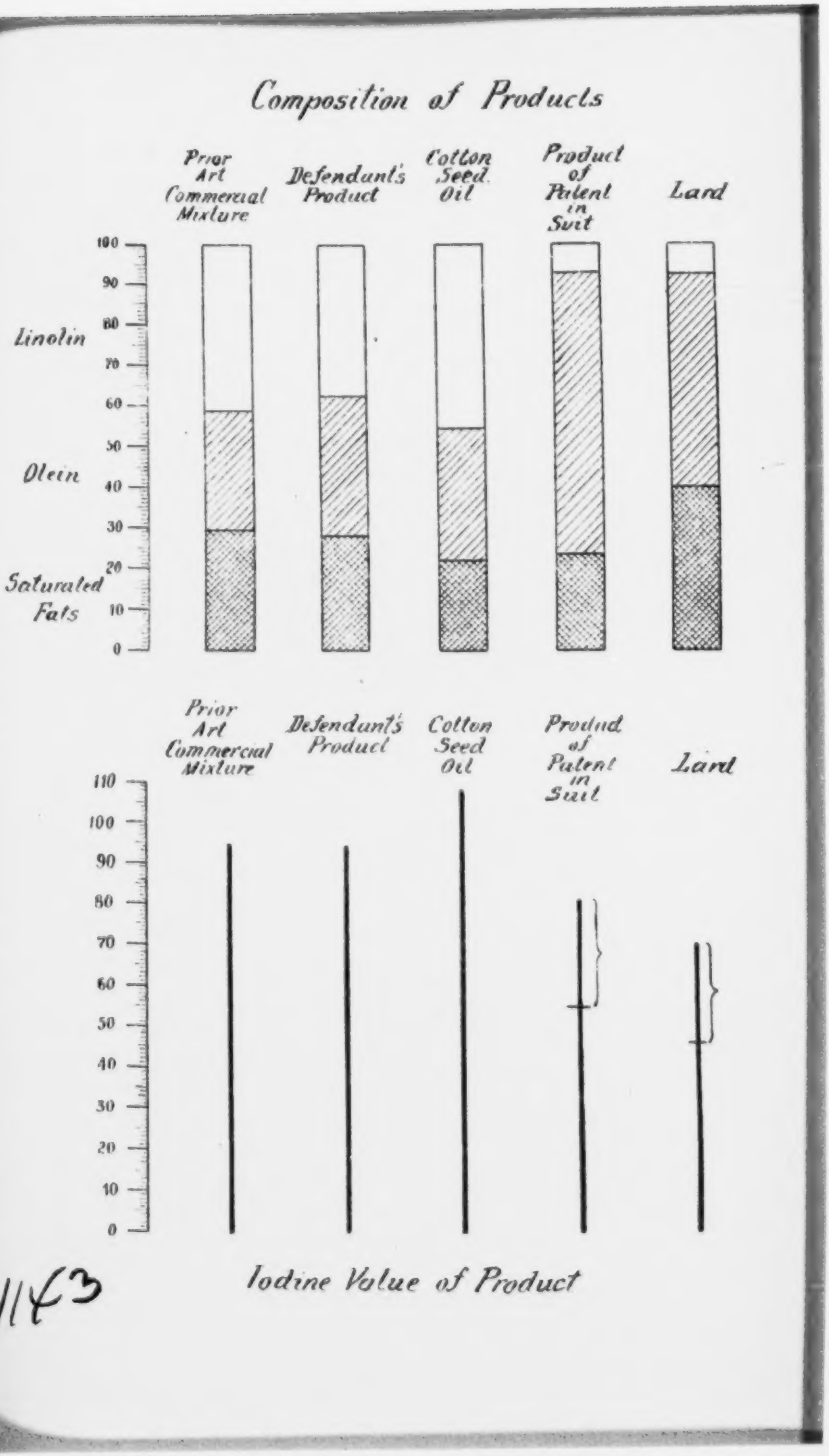
in the specification, has to be subjected to these various treatments before it becomes lard-like?

"A. Yes; lard is treated in that way." (p. 71).

It is thus evident that the word "lard-like" as used in the specification and claims cannot refer to the physical appearance of the product because, like lard and the commercial mixtures, the physical appearance depends upon the processes (not referred to in the patent in suit) to which such products are subjected, by which the products are rapidly chilled, in order to give them the smooth, lard-like appearance. In fact, the term "lard-like" as used in the patent can only refer to the chemical characteristics by which the patented product is alleged to be different from the commercial mixtures like Jewell compound, in which oleo stearin is blended with cottonseed
1142 oil, or Flake White, in which the hard hydrogenized oil is blended with the cottonseed oil.

(*b*) The iodine value of lard is low, being from 46 to 70. (Thorpe's Dictionary of Applied Chemistry 1912 Ed. Vol. III p. 248). That of the patented product is low, being from 55 to 80, and thereby overlapping that of lard. "A lard-like product thus prepared from cottonseed oil has * * * an iodine value ranging from about 55 to about 80" (Patent, p. 1, l. 105). The iodine value of the commercial mixture Flake-White is 95 and that of defendant's product is 94.7, and neither is lard-like in this respect. (The iodine value of Flake-White is stated in the Burchenal patent No. 1,135,935, Vol. 2, p. 965, l. 47, 48).

(Here follows diagram marked page 1143.)


Composition of Products
Prior Art Commercial Mixture
Defendant's Product
Cotton Seed Oil
Product of Patent in Suit
Lard
Linolin
Olein
Saturated Fats
100
90
80
70
60
50
40
30
20
10
0
Prior Art Commercial Mixture
Defendant's Product
Cotton Seed Oil
Product of Patent in Suit
Lard
110
100
90
80
70
60
50
40
30
20
10
0
Iodine Value of Product

1143

(*c*) The titer lard is 39°C. to 40°C. (Morrison, Q. 82, p. 326), while that of the patented product is 35°C. to 42°C. The defendant's product has a titer of 33.85°C. (Richter, Q. 13, 14, p. 572-3) which is less than that of lard or the patented product, and in this respect also is not "lard-like."

(*d*) The chemical composition of lard, in respect of its component glycerides, closely approximates the patented product. Lard has 8 to 10 per cent linolin; (Richardson Q.132, p. 569) the patented product has 5 to 10 per cent linolin. Lard contains a large amount of olein; the patented product likewise contains a large amount of olein (Richardson, Q. 132, p. 569).

"It is, therefore, my object in the preparation of my new lard-like composition and food product * * * to change the chemical composition of the oil to obtain a product with a high percentage of olein, a low percentage of linolin," etc. (Patent, page 1, lines 65 et seq.)

Defendant's product contains a large amount of linolin, to wit, 37.7 per cent, and the commercial mixtures contain 41.5 per cent (Richardson, p. 570, Q. 33); defendant's product contains 34.3 per
1144 cent olein and the commercial mixtures contain 29 per cent olein (Richardson, p. 570, Q. 33); defendant's product contains 28 per cent saturated glycerides, and the commercial mixtures contain 29.5 per cent saturated glycerides (Richardson, p. 570, Q. 33). Defendant's product is therefore practically identical with the prior art mixtures in composition and is not lardlike. These compositions are shown on the chart on the page opposite which graphically illustrates the similarity, both in iodine value and in composition, of lard and the patented product, and the dissimilarity therefrom of defendant's product and the prior art products, clearly demonstrating that defendant's product is not "lard-like" in the sense of the patent.

(*e*) Melting Point. The melting point is the sole characteristic mentioned in the patent and by the Court, which is common to defendant's product and to the patented product. But alone it is no distinctive test of identification, for all lard substitutes have approximately the same melting point as lard. Moreover, the patentee himself in the prosecution of his application discarded the melting point in favor of iodine value as a mark of identification, saying:

"These products have no sharp or definite melting point" (Vol. II, p. 835).

So, also, Lewkowitsch, the authority cited at the trial, says:

"The several methods proposed hitherto for the determination of the melting point of fats, unfortunately lead to discordant results. Nor is this to be wondered at, if we remember that natural oils and fats are not definite chemical substances, characterized by a definite melting point, but are mixtures of a number of glycerides" (Chemical Technology of Oils, Fats and Waxes, Vol. 1, p. 315, 5th Ed. 1913).

VII. In the foregoing pages we have shown that defendant's product widely differs from the patented product, being like the commercial mixtures, and thus is essentially excluded from the
1145 scope of the term "lard-like," by which the patentee distinguishes his product from the commercial mixtures. There are other tests, however, set forth in the patent, which accentuate the differences between defendant's product and the patented product, which will be briefly referred to as follows:

(*a*) Percentage of added hydrogen.

In producing the product of the patent in suit, to make it more "lard-like" than commercial mixtures, the specification states that

"According to the present invention, the amount of hydrogen absorbed is carefully regulated and limited" (p. 1, ll. 87-89).

The amount of hydrogen which is absorbed is stated to be "from about 1.5% to 2.5% of additional hydrogen more than in the non-hydrogenized material" (p. 2, l. 5).

By this careful regulation of the amount of hydrogen absorbed, to wit, 1.5 per cent to 2.5 per cent more than in the original oil, there is produced by the batch process of hydrogenation a product which is lard-like in its low iodine value of 55 to 80, in its titer of 35 to 42° C., in its small proportion of linolin and its high proportion of olein.

In defendant's product, there is less than .9 of 1 per cent (.875 per cent to be exact) of hydrogen more than in the cottonseed oil. (Richter Q. 197, p. 603). In other words, in making defendant's product, there has been absorbed about one-third to one-half only of the amount of hydrogen absorbed in making the patented product. In defendant's process this small amount of hydrogen produces a product which has a high iodine value of 94.7, like the commercial mixtures; a titer of 33.85° C., much below that of lard; a high amount of linolin, a low amount of olein and substantially the same amount of saturated fats that are characteristic of the commercial mixtures.

1146 (*b*) Responsiveness to Halphen test.

The testimony hereinafter quoted is to the effect that defendant's product, like the commercial mixtures, shows free cottonseed oil even when subjected to this unreliable test. This evidence need not be reiterated here. In respect to the responsiveness to the Halphen test, defendant's product is not lard-like, but is like the prior art mixtures.

(*c*) Liability to become rancid.

The patent states that the patented product "is not so liable to become rancid" (p. 1, l. 97) as the commercial mixtures. Dr. Bacon has testified (and his testimony is not controverted) that defendant's product, when subjected to a rancidity test, is like the commercial mixtures, and in this respect is not lard-like.

"R. D. Q. 364 * * * I say that these experiments demonstrate what we would expect from the chemical character of these products. The product of the type of 'Kream-Krisp,' which has

great deal of linolin in it, all other conditions being equal, becomes rancid very much more rapidly than a product containing less linolin of the type of lard or of the type of 'Crisco.' That is, 'Kream Krisp,' judged from a rancidity standpoint, or judged from its composition, is a very different compound from either 'Crisco' or lard, and even more different from the compound more narrowly described by Burchenal in the range of component glycerides."

"R. D. Q. 365. In these rancidity tests which you ran, how closely did 'Kream Krisp' and lard compounds run with respect to their resistance to rancidity?

A. 'Kream Krisp' is very much like lard compound in regard to becoming rancid. It becomes rancid very much the same as lard compound does, and one would expect that, of course, from its composition, as it is very close to lard compound in its constituents, so far as linolin, olein and stearin are concerned" (pp. 722-723.)

1147 The word "lard-like" as used in the claim, when construed in the light of the specification, has, as is evident from the foregoing discussion, a definite and limited meaning. The word is used to distinguish a product having substantially the iodine value, composition and other specific characteristics of lard, as contrasted with a product having the iodine value, composition and other specific characteristics of the "commercial mixtures" or prior art products. The close resemblance of lard and the patented product, by the tests described in the patent, has been shown. By the same tests the substantial identity of defendant's product and the "commercial mixtures" has been shown. Therefore, since defendant's product is like the commercial mixtures and does not "more closely resemble lard than do the commercial mixtures," it is not the "lardlike" product of the patent and is not included by the word "lardlike" as construed by the specification.

VIII. Prior art products.

When the Court in its opinion said as to the patented product that

"there is no evideene that anybody else ever made it before, or that if this product is entitled to patent protection there is any closely related prior art",

the Court must have been unconsciously referring to the mode or process of making it, because the Court subsequently said:

"It may be assumed as true that by the mixture of cottonseed oil and animal stearin a substance can be produced which for practical purposes is the same thing as Burchenal's chemically changed cottonseed oil; etc."

"These prior art "things" or "substances" or lard substitutes, are what are concerned, and not their paths or processes of production. They are as follows:

1. A white or yellowish semi-solid product consisting of cottonseed oil and animal oleostearine, referred to in the patent, and in the Court's opinion.

1148 2. A white or yellowish semi-solid product consisting of cottonseed oil, and stearine from any source (including vegetable stearine) referred to in the Sears British patent No. 10,783 of 1887 (Record, Vol. II, pp. 1026.)

3. A white or yellowish semi-solid product consisting of cottonseed oil and hard hydrogenized oil. This product is "Flake White." The process by which it is produced consists in hydrogenizing 15% of cottonseed oil to hard fat and adding and blending it while hot and liquid with 85% of unhydrogenized cottonseed oil. The resultant product as a whole consists of cottonseed oil which may be said to have been incompletely hydrogenized and which is capable of absorbing more hydrogen. Plaintiff-appellant's brief, in respect of Flake-White, said,—

"The other patent, No. 1,135,935, of the same date, April 13, 1915 (which will be referred to as the 'mixture patent') is also for a Food Product employed under the trademark 'Flake-White' as a substitute for lard in cooking" (p. 2).

"the lard mixture which was sold under the name of 'Flake-White' and was a mixed product of 85% cottonseed oil and 15% hydrogenized cottonseed oil as a hardener" (p. 21).

"The court below need not have gone any further back than our own Flake-White patent to find in the prior art the nearest approximation among the mixtures. If there is no inventive distinction between the mixture and the homogeneous body it was sufficient for the decision of this case to say that Crisco is anticipated by the Flake-White." (p. 47.)

The Burchenal patent 1,135,935 (not in suit) describes Flake White as follows:

"the final product is a white or yellowish semi-solid, having a saponification value of about 195; an iodine value of about 95; a melting point of about 42° C.; and a titer of about 36° C. (p. 1, ll. 45-49; Vol. II, p. 865.)

This material has the following composition approximately; viz:

30% saturated fats.

1149 28% odein.

42% linolin (Morrison, plaintiff's chemical superintendent, Q. 177, p. 349).

Therefore, we understand the brief of appellant before this Court to concede that if there is no inventive distinction between the two products—Flake White and the patented product—then it is sufficient to say that the patent in suit is met by Flake White.

This product, Flake White, we do not find to have been considered in the Court's decision in its relation to the patented product or the defendant's product.

IX. Homogeneous " in the Sense of Mixtureless."

The holding of the Court that Kream Krisp (defendant's product) is homogeneous "in the sense of mixtureless" is contrary to the evidence.

Kream Krisp is physically homogeneous in the same sense and for the same reason that the prior art lard substitutes are physically homogeneous but this is due entirely to its subsequent treatment (i. e., by chilling and aeration) (Walker, p. 499, fol. 1496), just as the product of the patent in suit must be subsequently treated to give it the physical homogeneity of lard (Burchenal, p. 71, Qs. 491-495). The patent in suit, however, describes no such subsequent treatment.

(*a*) Instead of being a chemically homogeneous compound, defendant's product is a physical mixture of chemically different glycerides, but in different proportion from those stated in the patent in suit.

Dr. Baskerville (plaintiff's expert) defined "homogeneous" as follows:

"Q. 11. Have you examined it, the product taken from this can, Plaintiff's Exhibit, Defendant's product, to determine whether or not it is homogeneous, and if so, with what result? A. I 1150 have; it appears homogeneous (p. 432). * * *

X Q. 38. What is your understanding of the word 'homogeneous,' as used in your testimony? A. Uniform throughout.

"X Q. 39. Do you mean chemically uniform? A. I would say more physically uniform.

"X Q. 40. It is made up of different glycerides, differing from each other chemically? A. Yes" (pp. 436-437).

(*b*) Defendant's product consists of cottonseed oil and hydrogenized cottonseed oil blended and mixed together.

Dr. Walker (defendant's expert):

"X Q. 124. Would it be correct to say, then, that in defendant's processes, the cottonseed oil is caused to absorb a limited amount of hydrogen by reacting on the oil with hydrogen in the presence of a catalytic agent and at an elevated temperature? A. It would be more accurate to say that a portion of the cottonseed oil was made to react with hydrogen at an elevated temperature, because, of course, there is a relatively large portion of the oil which passes through the capsule and is not acted on by the hydrogen at all.

"X Q. 125. How do you know that fact? A. Because in the oil we have approximately 22 per cent stearin, which cannot be acted on by hydrogen; we have in the final product some 34 per cent of linolin, which has not been acted on by hydrogen; we have in the final product about 33 or 34 per cent of olein, which may not have been acted on by hydrogen at all. So that the only percentage of the oil which has really been acted o nby hydrogen is not more than 14 or 15 per cent" (Walker, p. 526).

"* * * X Q. 223. Do you think that there is any different

kind of action so far as hydrogenation is concerned, going on in the for the time being zone of the spray and the parts of the diaphragm outside of the zone? A. No; I rather think that the hydrogenation which takes place does so the moment the oil strikes the surface of the nickel and uses up the hydrogen which is adsorbed on the nickel or which is there in the form of the unstable hydrides, and that the oil which passes through after that goes through without reaction.

"X Q. 224. But that is merely a theory, is it not? A.
1151 That is a theory based on the fact that we have so much oil in the resultant product which has not been affected by the hydrogen" (p. 545).

This testimony of Dr. Walker that the final product contains a large percentage of the original untreated and unchanged cottonseed oil has not been controverted or denied.

The exact analysis of defendant's product was subsequently given by Mr. Richter (Q. 14, p. 573), as follows:

Saturated fats, 28%.
Olein, 34.3%.
Linolin, 37.7%.

As this product was made by using cottonseed oil comprising 21.5% saturated fats, 32.5% olein and 46% linolin, it is a matter of mathematical calculation to show that the defendant's product consists largely of unchanged free cottonseed oil to which has been added a small amount of hardened or solid fat. When defendant's product is slowly cooled, it invariably separates out into two parts, one an oil and the other a solid (Richter, Qs. 216-218, p. 606), thus proving that it is a mixture.

(*c*) Defendant's product (except the sample introduced in evidence which had been overheated and therefore lost its ability to respond to the test) (Richter, p. 576, Q. 34), when subjected to the Halphen test, shows the presence of cottonseed oil in the product.

"We always secured positive results in this reaction, never before have we secured a negative result" (p. 576).

"* * * I said that we have applied the Halphen test to Kream Krisp very many times, and that the first sample that we ever received or tested to show a negative result was a sample (the particular exhibit of Kream Krisp in the case) that Mr. May forwarded to us" (p. 620).

Even if defendant's product should or ever did fail to re-
1152 spond to the Halphen test, that would not be an indication that cottonsed oil is not present therein.*

It was conceded at the trial that the failure of the product to

*"Hence the Halphen color reaction can be obtained with lard, etc., which are absolutely free from admixed cottonseed oil. It should be further noted that failure to obtain the color in the Halphen test does not prove the absence of cottonseed oil" (Lewkowitsch, Vol. II, p. 204, 5th Ed.).

respond to the Halphen test does not negative the presence of cottonseed oil. Concerning this Halphen test, Dr. Baskerville says:

"It is probably the best test for the detection of cottonseed oil, but it is not an absolute final test. For instance, there are other oils which will give that test. Even lard will give that test if the animals have been fed upon cottonseed meal" (Q. 23, p. 434).

Dr. Baskerville further stated that if cottonseed oil in commercial treatment is heated to a high temperature, the Halphen test is no longer the indication of the presence or absence of cottonseed oil (Qs. 82, 83, p. 444).

Moreover in the brief filed before the District Court, the plaintiff said:

"The Halphen test, moreover, is irrelevant and immaterial from any practical standpoint. It is admitted by everybody that the substance which reacts in showing the test is so minute that no one has ever determined exactly what it is" (p. 40).

In any event, even if defendant's product should not respond to the Halphen test because of the absence or destruction of this minute substance, it is no indication that it does not consist mainly of cottonseed oil in admixture with the hydrogenized fat. If the test is to be relied on, then according to Mr. Richter, the proof is that defendant's product is a mixture comprising cottonseed oil as one ingredient.

(*d*) If the Court intended by the phrase "homogeneous in the sense of mixtureless" to convey the thought that defendant's product is produced without the act of mixing, whereas the prior art products are produced by an act of mixing, then obviously the word
1153 "mixtureless" has a process meaning, and refers to no attribute or characteristic of the product itself. Even when so used it does not correctly describe the process by which defendant's product is made. As shown by Dr. Walker's evidence, only a very small portion of the oil is hydrogenized. This small portion is commingled and mixed with the remaining unhydrogenized oil, and this mixing is an inevitable feature of the process. The deodorization, refrigeration on the lard roll, and aeration by the pickers, to which the product is subjected as it comes hot from the hydrogenator or capsule effectively mix the hydrogenized portion and the unhydrogenized portion of the oil together, so that a physically homogeneous mixture is the result.

There is no evidence to support the proposition or contention that defendant's product is chemically homogeneous or is mixtureless in the sense that it does not consist of a mixture of cottonseed oil and hydrogenized oil. The evidence above quoted affirmatively shows that defendant's product is, first, a mixture of chemically different glycerides, i. e., solid and liquid fats, and, second, is actually a mixture of free cottonseed oil and hard hydrogenized oil. The Court probably was led into fundamental error by assertions in plaintiff-appellant's brief which were unsupported by citations from the record, and which are contrary to the facts.

(*e*) An Analogy.

Sodium hydrate crystals may be thrown into water (in which they are freely soluble) and, when so added, a mixture of sodium hydrate and water is produced, in the form of a solution. That is one way of making the mixture.

So also a piece of metallic sodium may be thrown into water (with which it spontaneously combines chemically to form sodium hydrate) and when so added a mixture of sodium hydrate and water is likewise produced, in the form of a solution. That is another way of making the mixture.

1154 The solution obtained by adding the metallic sodium to the water is none the less a mixture (i. e., a mixture of sodium hydrate with water) because produced by treating the water with metallic sodium—and thereby converting a part of the water chemically into sodium hydrate, which thereupon goes into solution,—than is a like mixture produced by throwing sodium hydrate crystals into water. Although produced by different procedures, the final product is the same.

To say, in the one case, that the water is partially "sodiumized" because the sodium has acted chemically upon the water, establishes no rational distinction, since the final products of both procedures are mixtures. The final product is the thing to be considered, and it is a "mixture" (and not "mixtureless") although obtained by the chemical action of the metallic sodium upon the water, instead of by the physical admixture of sodium hydrate crystals therewith.

X. "Wholly consisting of an incompletely hydrogenized oil."

In the preceding discussion of "homogeneous", it is shown by quotations from the evidence that defendant's product does not "wholly consist of an incompletely hydrogenized oil", that is, of an oil in which each molecule has been chemically changed.

In the sense that it consists in part of hyrogenized cottonseed oil and in part of free cottonseed oil mixed or blended together, defendant's product may be said to consist of incompletely hydrogenized oil, but only in the same sense that Flake White, a prior art product made by mixing 15% hydrogenized oil with 85% cottonseed oil, is a product consisting of incompletely hydrogenized oil. In these products, as in the commercial mixtures of cottonseed oil and animal oleo stearin, the hard fat, hot and liquid, is blended and commingled with the oil, and uniformly distributed throughout the resultant physically homogeneous

1155 product. Dr. Baskerville asserts that the purpose of adding hard fats by hydrogenation of the oil is to give the cottonseed oil the physical consistency of lard. Thus:

"Q. 120. Why do you consider the added fats to be the signnificant and substantial thing?

"A. Because the added fat brings about an elevation of the melting point.

"Q. 121. And what does the added fat have to do with the lard-like qualities of the product?

"A. When the proper quantity is there, the substance becomes semi-solid and acquires the physical properties of lard. * * *

By the Court:

"Q. 123. Where is there anything in this patent about added fats?

"A. It means added solid fat.

"Q. 124. By reason of the hydrogenation?

"A. Yes, sir" (p. 741).

"* * * Q. 151. As I understood you from a practical standpoint, the cook using the substance has to do with the consistency of the substance which is attained by the increase of solids due to hydrogenizing?

"A. I think so" (p. 744).

Mr. McCaw, plaintiff's superintendent of Flake White manufacture, testified that the addition of oleo stearin (hard fat) to cottonseed oil is for the same practical purpose.

"Q. 239. What was the function of the oleo stearin in the compound? Was it that of stiffening or hardening the cottonseed oil so that the mixture would be semi-solid at ordinary temperatures?

"A. Our object in using oleo stearin in the manufacture of a lard substitute was to give the oil a consistency approximating the consistency of hog lard.

"Q. 240. And inasmuch as cottonseed oil, per se, at ordinary temperature, was a liquid, you added the oleo stearin to harden it sufficiently so that at ordinary temperatures it would have approximately the consistency of lard?

"A. Yes" (p. 289).

Mr. Morrison, who is corroborated by Dr. Baskerville, testifies that the same results are secured where the solid fats are added to the oil by hydrogenizing a part of it, or by adding separately-hydrogenized hard fat.

1156 "R. D. Q. 124. In producing a substance of corresponding consistency by partial hydrogenization and by mixing as in the making of the compound, which adds the greater percentage of solid fats?

A. In the final analysis they are practically the same. In the compounds we add a given amount to the oil, whereas in the hydrogenated products like 'Kream Krisp' and 'Crisco' we increase the solids at the expense of the liquid. So that in the ultimate analysis, however, the ratio between the solids and the liquids is pretty nearly the same.

"R. D. Q. 125. But when it is done by the hydrogenating process, does the process increase the percentage of saturated fats to the same extent that they are increased by the addition of them in making the compound?

A. Possibly not quite, but it is very close to the same figures" (p. 791).

Dr. Baskerville testified:

"X Q. 242. You have stated in your answer to question No. 123, that solid fat is added by hydrogenation to cottonseed oil. What

is the essential difference in the resulting product, so far as making the product semi-solid is concerned, whether you increase the solid fat by hydrogenation or in some other way; say, for instance, by adding tri-stearin mechanically, or with your hands?

A. I think the addition of hard stock will raise the melting point.

"* * * X Q. 247. Does it make any difference in the consistency of the product whether the solid fat has been increased in the oil by hydrogenation or by adding oleo stearin thereto?

A. Very much alike.

"* * * X Q. 249. What difference would there be in the products in other respects?

A. It would depend entirely upon the treatment to which it has been subjected.

"X Q. 250. What treatment do you mean, doctor?

A. Tell me what particular products you mean and then I may be able to answer.

"X Q. 251. Say a product which has a melting point of 41 degrees centigrade, which has been produced by adding oleo-stearin to cottonseed oil, and another having the same melting point but which was produced by hydrogenizing the oil; what difference in those two products would there be?

1157 A. I think there would be a difference that would be determined by the Salphen test, but that is not absolutely final" (pp. 767 and 768).

Dr. Baskerville would not say that these two products would actually differ in any respect one from the other.

The testimony quoted in the foregoing pages, including those under the heading "Homogeneous," is conclusive that defendant's product does not "wholly" consist "of an incompletely hydrogenized cottonseed oil", but is a product consisting of cottonseed oil and hard fats produced by hydrogenation of the oil without affecting the remainder of the cottonseed oil.

XI. "Iodine value."

The iodine value is a direct gauge of the unsaturated components of a product. It is regarded as an important test of identification. Lewkowitch, the authority previously referred to, says (vol. 1, p. 415, 5th edition):

"The determination of the iodine value furnishes one of the most valuable characteristics in the technical fat analysis. If we have to identify the natural oil, fat or wax, the iodine value indicates in an unmistakable manner the class to which it may belong. The iodine value will thus, as a rule, lead in the quickest manner to the identification of a given natural oil, fat or wax. Furthermore, if a hitherto unknown specimen be under examination, the iodine value will at once point to the most likely class or group in which the new natural oil or fat should be placed in the system."

The patent states that the patented product falls within a wide range, to wit, 55 to 80. Defendant's product has an iodine value of 94.7 (Richter, Qs. 13, 14, pp. 572-573) away outside of that range. The Court therefore erred in stating that defendant's product is

within the range of iodine value set forth in the patent. We can account for this error in no other way than that the writer of the opinion may have picked up by mistake the other Burchenal
1158 patent No. 1,135,935 not in suit, in which the iodine value of the product is therein described as 95.

XII. "Titer."

Defendant's product has a titer of 33.85°C. (Richter Qs. 13, 14, pp. 572-3) whereas the range of titer given in the patent is 35°C to 42°C., and consequently the Court erred in saying that defendant's product is within the limits of titer given in the patent. The titer is one of the tests of identity given in the patent in suit and it was not appreciated by the Court that by this test defendant's product is not the product of the patent. Tier, roughly speaking, is a definite point at which a given amount of free fatty acids (after being separated from the glycerine) solidify; or technically, it is a definite point at which the temperature of the slowly cooled mixture of free fatty acids remains stationary momentarily, owing to the fact that the heat of radiation from the mass is balanced by the heat of crystallization of the mass. The titer of the product depends largely upon the proportions in which the free fatty acids (namely saturated acids, oleic acid and linolic acid) are potentially found in the product. Hence, the titer is indicative of the essential character or composition of an oil or fat to be identified, and is evidence that defendant's product is not the "lard-like" product of the patent.

The foregoing are considerations which are controlling in favor of the defendant. The evidence quoted or referred to shows, we respectfully submit, fundamental errors in the finding of the Court. They show that defendant's product is not, and never has been conceded to be, "lard-like" "homogeneous in the sense of mixtureless," and "wholly consisting of incompletely hydrogenized oil," or "within the range of iodine value" and "titer" specified in the patent or the application therefor.

1159 XII. Error in Law.

The Court applied, in considering the identity of defendant's product with the patented product, a correct rule of law, which it did not follow in comparing the patented product with the prior art.

The Court unconsciously construed the claims of the patent in suit as though they were drawn to cover a process and not a product. We think this will be apparent by presenting the following excerpts from the opinion:

"Without resorting to the extreme doctrine of Potts v. Creager, 155 U. S. 597 it seems to us that the question presented by this record depends upon whether the thing produced by partial hydrogenation is a different thing from that which existed before hydrogenation began, and that which would exist when it ended" (p. 4).

"We are satisfied of the truth (entirely apart from all presumptions of defendant's testimony that it was not until Kayser had returned to England, or was on the point of going, that it occurred to anyone that it was not necessary to first harden by hydrogenic satur-

ation the cottonseed oil, and then mix it with the fluid article in order to make a lard-like compound;—but that the hardening process might be arrested in the manner and for the purposes disclosed by Burchenal's application" (p. 8.)

"It may also be quite true that Burchenal's contribution to the sum of human knowledge grew out of the trained business man's observation of the possibilities of a chemist's process, which he was himself quite incapable of devising" (p. 8).

When the Court referred to the conception that it was not necessary to first harden the cottonseed oil and then to mix it with the fluid cottonseed oil to make a lard-like compound, but that the hardening process might be arrested at a certain point, the Court was referring to and contrasting different modes or processes, and consequently if the Court intended by the words "mixtureless" and "mixture" to indicate that the two resultant articles are to be distinguished by the path or process of their production, it has unconsciously departed from the rule of law with respect to products,—that "it makes no difference by what path or process" the articles are manufactured.

1160

If the two articles are the same, then to call one a mixture because of its mode of production, and to call the other mixtureless because no separate act of mixing was a part of its mode of production, does not create any distinction between them as products or compositions of matter.

In other words, it must be fundamental law, that if the product which is produced by incompletely hydrogenizing oil is the same product which is produced by blending cottonseed oil and hard fat (irrespective of whether such hard fat is hard hydrogenized oil or oleo stearin) then they are not patentably different.

The Court said:

"But before Burchenal many imitation lards were made by mechanically mixing hard animal fats and cottonseed oil in varying proportions, and some of these mixtures show on analysis substantially the same chemical characteristics as are shown by Burchenal's chemically produced 'homogeneous semi-solid.' Therefore it is said, that to make the same thing as had been made by earlier lard imitators but in a different way, cannot warrant a patent upon the resulting thing or product, whatever may be true in respect of the process by which that product is reached. This is as much as to say (*c*) that the Burchenal article when completed and ready for use must be old, because other men had earlier arrived at the same chemical result by other paths" (p. 3).

"It may be assumed as true that by the mixture of cottonseed oil and animal stearin a substance can be produced which for practical purposes is the same thing as Burchenal's chemically changed cottonseed oil; but one is a mixture and the other is not, and assuming the difference to be unimportant from the standpoint of either chemist or cook, it is a vital difference from that of the law" (pp. 4, 5).

1161

If it is true, as the Court has assumed, that the "chemical result" or product which the Court terms "a mixture," is the "same thing" or "chemical result" which the Court terms "mixture-

less" or "Burchenal's chemically changed cottonseed oil," and that the difference between them is such that the chemist who analyzes or makes them and the cook who uses them, deems the difference unimportant, then the Court logically and unhesitatingly should have declared the patent in suit to be invalid. Indeed, in respect of infringement, the Court has correctly stated the rule of identity as follows:

"It is true (*b*) that defendant's process of manufacture is very different from that of plaintiff, and we are willing to assume it different from and better than anything known to Burchenal or developed by Kayser. But this patent is upon a product, and if the product complained of is the patented article substantially as described, it makes no difference by what path or process, new or old, inferior or improved, the infringing product is manufactured. (General Electric Co. v. Laco-Phillips Co., 233 Fed. Rep., 96.)" (pp. 8, 9).

The same rule is applicable to novelty as to infringement.
Wood Paper Patent Case, 90 U. S. 566;
Cochrane v. Badische 111 U. S. 293.

The Court therefore erred as a matter of law in not holding the patent in suit to be invalid.

XV. (*a*) The material errors of fact which we have pointed out showing that the defendant's article does not respond to the essential tests and characteristics of the patented article "substantially as described" in the patent and by which the patentee is bound, we respectfully submit constitute sound ground for a rehearing.

(*b*) The material error of law which we have pointed out, i. e., that the Court erred as a matter of law in not holding the patent in suit to be invalid also constitutes sound ground for a rehearing.

1162 Accordingly a rehearing and a stay of the mandate are prayed.

Respectfully submitted,

JOHN C. PENNIE,
Solicitor and of Counsel for Appellee-Petitioner.
MARCUS B. MAY,
Of Counsel for Appellee-Petitioner.

Certificate of Counsel.

We herey certify that we have examined the foregoing petition for rehearing, and in our opinion the petition is well founded in point of fact and law; and it is not interposed for the purpose of delay.

JOHN C. PENNIE,
MARCUS B. MAY,
Of Counsel for Appellee-Petitioner.

New York, N. Y., December 19, 1918.

1163 United States Circuit Court of Appeals, for the Second Circuit, October Term, 1918.

No. 10.

Petition Filed December 20, 1918. Decided January 9, 1919.

PROCTOR & GAMBLE COMPANY, Complainant-Appellant,

v.

BERLIN MILLS COMPANY, Defendant-Appellee.

Appeal from the District Court of the United States for the Southern District of New York.

Before Ward, Rogers and Hough, Circuit Judges.

Kerr, Page, Cooper & Hayward, for Appellant.
John C. Pennie, for Appellee.
Marcus B. May, of Counsel.

On Petitions for Rehearing.

HOUGH, *C. J.*:

The principal producer of cottonseed oil has joined in this application as amicus curiæ and by figures of oil production as well as of food products derived therefrom, has greatly magnified the importance of Burchenal's patent.

It seems to be now assumed that hydrogenized oil, as a substitute for lard, is so superior to an amalgam, combination or mixture, of oil and animal fat, or oil and stearin artificially produced—that the patent in suit is almost basic, instead of disclosing a mere variant among products of equal utility.

1164 If this importance in result be real, it is a reason for giving to the claims in suit a broad range of equivalents; and suggests reflections not contained in our former opinion, but leading to an identical result.

Defendant's petition restates with painstaking ability an argument perfectly good, if the premise *he* admitted. That premise is that Burchenal invented nothing but an artificial lard or lard substitute so near to existing articles of commerce that the only field open to him was limited to a particular mode of making, or by specifically stated chemical tests.

The chemical tests or limits indicated in Burchenal's disclosure, are put with an "about"; they are not carried into the claims sued on, as they are into some not in suit; nor do all the usable and marketable specimens of defendant's factory show uniform tests. We adhere to the remarks concerning "iodine-values, titer and melting points" heretofore made, but do not and did not ground judgment thereon.

Our decision is and has been based, on a firm conviction, that what is practically lard, consisting solely of one vegetable oil in a state of arrested hydrogenation, is a new thing in the sense of the patent law; almost as new as a synthetic egg, evolved from vegetable albumen by chemical treatment.

The results of such evolutionary treatment, are by their genesis so novel, that analysis of constituents is immaterial. Patentable novelty is not in their parts—as revealed by quantitative or qualitative analysis, but in a practical functional identity between animal products, and a vegetable product as chemically changed.

Our view of the nature of this invention, permitted us to assume (not find) a possibly quite superior method as used by defendants;—but when the product was seen to be something that was (in effect) lard resulting from an arrested hydrogenation of cottonseed oil, there was infringement.

On this record, it may almost be said,—that defendants' machines will cease to produce infringements, only when they yield what a plain man would not call lard.

Application denied.

Rogers, J., concurs; Ward, J., not voting.

1165 At a Stated Term of the United States Circuit Court of Appeals, in and for the Second Circuit, Held at the Court Rooms in the Post Office Building in the City of New York, on the 23rd Day of November, One Thousand Nine Hundred and Eighteen.

Present:

Hon. Henry G. Ward,
Hon. Henry Wade Rogers,
Hon. Charles M. Hough,
Circuit Judges.

PROCTER & GAMBLE COMPANY, Complainant-Appellant,

v.

BERLIN MILLS COMPANY, Defendant-Appellee.

Appeal — the District Court of the United States for the Southern District of New York.

This cause came on to be heard on the transcript of record from the District Court of the United States, for the Southern District of New York, and was argued by counsel.

On consideration whereof, it is now hereby ordered, adjudged and decreed that the decree of said District Court be and it hereby is reversed with costs in both courts and cause remanded with instructions to enter a decree in accordance with the opinion of this court.

It is further ordered that a Mandate issue to the said District Court in accordance with this decree.

H. W. R.
C. M. H.

1166 [Endorsed:] United States Circuit Court of Appeals, Second Circuit. Procter & Gamble Co. v. Berlin Mills Co. Order for Mandate. United States Circuit Court of Appeals, Second Circuit. Filed Jan. 14, 1919. William Parkin, Clerk.

1167 At a Stated Term of the United States Circuit Court of Appeals for the Second Circuit, Held at the Court Rooms in the Post Office Building, City of New York, on the 20th Day of January, 1919.

Present:

Hon. Henry G. Ward,
Hon. Henry Wade Rogers,
Hon. Charles M. Hough,
Circuit Judges.

PROCTER & GAMBLE COMPANY, Complainant-Appellant,

v.

BERLIN MILLS COMPANY, Defendant-Appellee.

A petition for a rehearing having been filed herein by counsel for the appellee;

Upon consideration thereof it is

Ordered that said petition be and hereby is denied.

H. W. R.
C. M. H.

Endorsed: United States Circuit Court of Appeals Second Circuit Procter & Gamble Co. vs. Berlin Mills Co. Order United States Circuit Court of Appeals Second Circuit. Filed Jan. 20, 1919. William Parkin, Clerk.

1168 UNITED STATES OF AMERICA,
Sourthern District of New York, ss:

I, William Parkin, Clerk of the United States Circuit Court of Appeals for the Second Circuit, do hereby Certify that the foregoing pages, numbered from 1 to 1167 inclusive, (2 volumes) contain a true and complete transcript of the record and proceedings had in said Court, in the case of Procter & Gamble Company against Berlin Mills Company, as the same remain of record and on file in my office.

In testimony whereof, I have caused the seal of the said Court to be hereunto affixed, at the City of New York, in the Southern District of New York, in the Second Circuit, this 3d day of April in the year of our Lord One Thousand Nine Hundred and Nineteen and of

the Independence of the said United States the One Hundred and Forty-Third.

[Seal United States Circuit Court of Appeals, Second Circuit.]

WM. PARKIN,
Clerk.

1169 UNITED STATES OF AMERICA, *ss:*

[Seal of the Supreme Court of the United States.]

The President of the United States of America to the Honorable the Judges of the United States Circuit Court of Appeals for the Second Circuit, Greeting:

Being informed that there is now pending before you a suit in which Procter & Gamble Company is appellant, and Berlin Mills Company is appellee, which suit was removed into the said Circuit Court of Appeals by virtue of an appeal from the District Court of the United States for the Southern District of New York, and we, being willing for certain reasons that the said cause and the record and proceedings therein should be certified by the said Circuit Court of Appeals and removed into the Supreme Court of the United
1170 States, Do hereby command you that you send without delay to the said Supreme Court, as aforesaid, the record and proceedings in said cause, so that the said Supreme Court may act thereon as of right and according to law ought to be done.

Witness the Honorable Edward D. White, Chief Justice of the United States, the thirtieth day of April, in the year of our Lord one thousand nine hundred and nineteen.

JAMES D. MAHER,
Clerk of the Supreme Court of the United States.

1171 [Endorsed:] File No. 27,050. Supreme Court of the United States, No. 964, October Term, 1918. Berlin Mills Company vs. Procter & Gamble Company. Writ of Certiorari. United States Circuit Court of Appeals, Second Circuit. Filed May 3, 1919. William Perkin, Clerk.

1172 Untied States Circuit Court of Appeals, Second Circuit, October Term, 1918.

In Equity. No. 10.

PROCTER & GAMBLE COMPANY, Appellant,

v.

BERLIN MILLS COMPANY, Appellee.

Stipulation.

It is hereby stipulated and agreed that the transcript already filed in the Clerk's Office of the Supreme Court of the United States, with

the petition for the writ of certiorari, be taken as the return to the writ of certiorari issued out of the Supreme Court on he 30h day of April, 1919.

JOHN C. PENNIE,
MARCUS B. MAY,
Counsel for Appellant.
THOMAS B. KERR,
Counsel for Appellee.

New York, N. Y., May 3, 1919.

1172½ To the Honorable the Supreme Court of the United States, Greeting:

The record and all proceedings whereof mention is within made having lately been certified and filed in the office of the clerk of the Supreme Court of the United States, a copy of the stipulation of counsel is hereto annexed and certified as the return to the writ of certiorari issued herein.

Dated, New York, May 15th, 1919.

WM. PARKIN,
Clerk of the United States Circuit Court of Appeals for the Second Circuit.

1173 [Endorsed:] United States Circuit Court of Appeals, Second Circuit. 964—27050. Procter & Gamble Co. v. Berlin Mills Co. Return to Certiorari.

1174 [Endorsed:] File No. 27,050. Supreme Court U. S. October Term, 1918. Term No. 964. Berlin Mills Company, Petitioner, vs. Procter & Gamble Company. Writ of certiorari and return. Filed May 7, 1919.